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Vol. 10, No. 11 Suppl., June 15, 1956

BIOLOGY AND MEDICINE

RADIATION EFFECTS

3408   CH-3782

Argonne National Lab., Lemont, Ill.
BIOLOGY DIVISION QUARTERLY REPORT [FOR]
NOVEMBER 1946 TO JANUARY 1947. Austin M. Brues,
ed. Feb. 1, 1947. Decl. Dec. 20, 1955. 101p.
Contract W-31-109-eng-38. $15.30(ph OTS);
$5.40(mf OTS).

3409   HW-38198

Hanford Atomic Products Operation, Richland, Wash.
RADIOLOGICAL SCIENCES DEPARTMENT RESEARCH
AND DEVELOPMENT ACTIVITIES. Quarterly Progress
Report April–June, 1955. H. M. Parker. July 11, 1955.
Decl. Dec. 6, 1955. 31p. Contract W-31-109-eng-52.
$4.80(ph OTS); $2.70(mf OTS).

Progress is reported in the radiobiological-ecological
survey of the Columbia River; the effects of β particles
from Ru^{106} plaques mounted against the skin of swine and
rabbits; the tissue distribution of Pu following intragastric
administration in swine; factors affecting the cutaneous
absorption of Pu in swine; the tissue distribution and
maximum permissible concentration of Ru in rats; tritium
absorption and metabolism in rats; the radioisotope build-
up in rats receiving reactor effluent as drinking water;
factors influencing the uptake of fission products in plants;
and modifications in methods of radiation monitoring and
waste disposal. (C.H.)

RADIATION HAZARDS AND PROTECTION

3410   HW-25239

Hanford Works, Richland, Wash.
RECAPITULATION OF TOLERABLE CONCENTRATION OF
RADIOIODINE ON EDIBLE PLANTS. Aug. 4, 1952. Decl.
Dec. 6, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

Preliminary results from a two-year study led to the
conclusion that sheep will be undamaged if fed 5 μc I^{131}/day
The corresponding limit on vegetation consumed is 6×10^{-5}
μc I^{131}/gm. (C.H.)

3411   K-236

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak
   Ridge, Tenn.
DESIGN OF AIR-BORNE ALPHA EMITTER SAMPLER.
D. J. Johnson. June 30, 1948. Decl. Nov. 29, 1955. 9p.
Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An investigation was undertaken to determine the
feasibility of either redesigning the existing air-borne
alpha emitter sampler (vacuum cleaner type) or to provide
a substitute which would overcome some of the undesirable
features of the existing sampling unit. As the present unit
could not be lightened sufficiently to meet the weight re-
quirements of a redesigned unit, it was decided to use a

light weight, high speed industrial type blower. Flow
measurement was accomplished by installing a small
pressure gauge, calibrated in CFM, up-stream of a fixed
orifice on the discharge nozzle. The flow regulator
consisted of a simple Butterfly valve located between the
filter holder and the blower section nozzle. One unit was
assembled and field tested with satisfactory results.
(auth)

3412   M-4087

Monsanto Chemical Co., [Dayton, Ohio].
GENERAL HEALTH SAFETY RULES. Louis B. Silver-
man. Apr. 7, 1944. Decl. Nov. 29, 1955. Includes
Attachment: HEALTH METER. Apr. 26, 1944. 11p.
$3.30(ph OTS); $2.40(mf OTS).

Several rules and procedures are outlined for persons
working in hot laboratories or areas. (C.W.H.)

3413   NYO-5163

Mallinckrodt Chemical Works, St. Louis.
RADON MEASUREMENTS IN WAREHOUSE AND BOX
CARS CONTAINING HIGH GRADE ORE. S. H. Anonsen.
Feb. 11, 1946. Decl. Dec. 1, 1955. 5p. Contract
[W-14-108-eng-8]. $1.80(ph OTS); $1.80(mf OTS).

TOXICOLOGY STUDIES

3414   M-4337

Rochester, N. Y. Univ.
REPORT ON THE ACUTE TOXICITY FRACTIONS OF C_7F_{14}
AND C_8F_{16}. C. J. Spiegl and Benjamin Amdur. Dec. 27,
1945. Decl. Dec. 7, 1955. 5p. $1.80(ph OTS); $1.80(mf
OTS).

Approximate animal inhalation toxicity studies of the
vapors of C_7F_{14} and C_8F_{16} "Low Boiler" performed for
periods of 3 and 14 hr duration in rats and mice have
indicated a toxicity of the same order as that of CCl_4
for each of the materials. Animals survived for 14 days
following a 14-hr exposure to a concentration of 1.4 mg/l
of C_1H_{14} and a concentration of 1.1 mg/l of C_8F_{16}. A
comparison of repeated exposure was dangerous. (auth)

CHEMISTRY

3415   CC-3069

[Carnegie Inst. of Tech., Pittsburgh]
THE SOLUBILITY OF HELIUM IN TUBALLOY [(URANIUM)].
"A" Report No. 7 [for] Period May 1, 1944 to January 31,
1945. H. Seltz and C. W. Young. June 28, 1945. Decl.
Dec. 15, 1955. 16p. Contract W-7405-eng-277. $3.30
(ph OTS); $2.40(mf OTS).

Uranium was allowed to stand in contact with He at one
atm. pressure at a fixed temperature for an extended
period, the excess He was pumped off quickly, the system
closed off, and the pressure increase measured as a func-

tion of time. The metal was employed both in the form of a powder and for massive measurements. Under the conditions used the amount of He dissolved was not more than 10^{-7} moles per mole of U, and possibly no He was dissolved. (C.H.)

3416 CL-1039
Chicago. Univ. Metallurgical Lab.
SOLUBILITY DATA ON INORGANIC COMPOUNDS OF RARE EARTHS, PROTOACTINIUM, THORIUM, URANIUM, NEPTUNIUM, AND PLUTONIUM. Sol Wexler, comp. Nov. 5, 1943. Decl. Dec. 13, 1955. 15p. Contract [W-7405-eng-37]. (A-1432). $4.80(ph OTS); $2.70 (mf OTS).

Data on inorganic compounds of the rare earths, Pa, Th, U, Np, and Pu, which are insoluble in water, are given in tabular form. The material is divided into five sections: the name and formula; the conditions of precipitation; the solubility in various inorganic solvents; miscellaneous properties such as color, products on ignition, etc.; and the references. Quantitative solubility data are given where it has been found in the literature. Compounds have been listed in alphabetical order. (auth)

3417 NYO-5148
Mallinckrodt Chemical Works, St. Louis.
PACKAGING AND STORAGE OF [ORE REFINERY] RESIDUE CAKES. J. Harold Yeager. Dec. 14, 1945. Decl. Dec. 7, 1955. 7p. Contract W-14-108-eng-8. $1.80(ph OTS); $1.80(mf OTS).

It was found that ore refinery residue cakes could be best neutralized by using a strong caustic solution and adding 5 to 7 lbs of NaOH per 100 lbs of wet gangue. The most successful containers used to store the neutralized cake were new W-11 lacquered clamp-top drums. Reconditioned or second-hand drums were not considered satisfactory. Wooden kegs were also considered unsatisfactory because of leakage between the staves. Drying of the neutralized cake was tried and found to be the best method for storage. This method was disregarded in favor of the wet method because of the space and expense required for a dryer. (J.E.D.)

3418 RMO-2726
Tennessee Valley Authority, Wilson Dam, Ala.
UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL. PROGRESS REPORT [FOR] MAY 1954. May 27, 1954. Decl. Dec. 22, 1955. 12p. $1.80(ph OTS); $1.80(mf OTS).

In one of the processes studied for the beneficiation of leached zone ore, about two-thirds of the phosphate and uranium are separated as a slime concentrate after a preferential grinding operation. Quartz gangue then is floated from the tailing to leave a secondary concentrate of granular phosphate. The adverse effect of residual slime in the flotation step is reduced by desliming the tailing twice at 40 μ with a hydraulic cyclone. In batch flotation tests on the twice-deslimed sand, 92% of the phosphate was recovered at a grade of 31.7% P_2O_5 with the use of 0.3 lb of collector per ton of dry feed; at the same time 84% of the uranium was recovered at a grade of 0.017% uranium. In continuous flotation tests, 63% of the phosphate and uranium were recovered at a grade of 31.8% P_2O_5 and 0.016% uranium with the use of 0.4 lb of collector per ton of dry feed. Tests of the production of fertilizer from Florida leached zone ore were continued. Calcined, unbeneficiated leached zone ore was extracted in the pilot plant with 0.9

lb H_2SO_4 and 0.9 lb HNO_3 per lb of P_2O_5 in the ore. When the extract was ammoniated to a pH of 6 or less, the loss of nitrogen on drying the ammoniated slurry at 200°F in a laboratory oven was less than 1%. When the slurry had a pH of 7.7, 8% of the nitrogen was lost. Other tests indicated that it would be necessary to increase the ratio of recycle fines to ammoniated slurry in the granulation step as the proportion of sulfuric acid used in extraction was increased. Preliminary studies were made on a bench scale of separating the ammonium nitrate and tributyl phosphate — kerosene from the uranium by washing the filter cake with water. (auth)

ANALYTICAL PROCEDURES

3419 A-1076
Madison Square Area, Manhattan District, New York.
ANALYTICAL INFORMATION REPORT FOR THE PERIOD FEBRUARY 16—MARCH 31, 1945. Apr. 1, 1946. Decl. Dec. 8, 1955. 57p. $9.30(ph OTS); $3.60(mf OTS).

Procedures are presented for the indirect titration of U with potassium bromate; the spectrographic determination of Fe, Mg, and Mn in high-purity U metal and oxides; procedures for the determination of minute traces of Cu, Ni, Fe, Co, Zn, Pb, and Cd by a combined electrolysis-distillation-polarographic method; the colorimetric determination of Fe; the spectrophotometric determination of U; the spectrophotometric determination of Mg; the colorimetric determination of Mn and Mg; a comparision of the gravimetric and volumetric methods for the determination of free UO_2 in U brown oxides (97 to 98% UO_2 and 2 to 3% U_3O_8); the standardization of ceric sulfate; the preparation of ceric sulfate solution; the analysis of U oxides; the determination of C and H in U metal by burning the sample in an atmosphere of O_2; and the colorimetric determination of N in Mg. (C.H.)

3420 A-2157
Columbia Univ., New York. Div. of War Research.
ANALYSIS OF CONSTITUENTS AND IMPURITIES IN BCl_3. Charles M. Judson. Nov. 30, 1944. Decl. Dec. 7, 1955. 7p. Contract W-7405-eng-50. (100B-R-243). $1.80(ph OTS); $1.80(mf OTS).

Methods are described for the determination of $SiCl_4$, BF_3, Cl_2, and S in BCl_3. (C.H.)

3421 A-2158
Columbia Univ., New York. Div. of War Research.
COMPLETE ANALYSIS OF B SAMPLES. Charles M. Judson. Nov. 30, 1944. Decl. Dec. 8, 1955. 13p. Contract W-7405-eng-50. (100B-R-244). $3.30(ph OTS); $2.40(mf OTS).

Methods are described for the chemical analysis of elemental B. Methods for the determination of H_2O adsorbed on B, and the determination of Si, Fe, Ta, W, Mo, and other impurities in elemental B are described. (C.H.)

3422 A-2940
National Bureau of Standards, Washington, D. C.
THE DETERMINATION OF TRACES OF URANIUM IN LEAF ASH AND SOIL. G. W. Imirie, Jr. Nov. 1946. Decl. Dec. 13, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

A fluorimetric method is presented for the determination of trace uranium in leaf ash and soil. (C.W.H.)

3423 A-3502

Du Pont de Nemours (E. I.) and Co. Jackson Lab.,
[Wilmington, Del.]

THE RECOVERY OF URANIUM FROM MALLINCKRODT
CHEMICAL "306 [RESIDUES]." Problem Report [for]
Period August 24, 1944–October 25, 1944. F. B. Stilmar.
Dec. 10, 1945. Decl. Dec. 8, 1955. 6p. Contract W-7412-
eng-151. (JWD-64) $1.80(ph OTS); $1.80(mf OTS).

A laboratory procedure is described for the recovery of
U from Mallinckrodt Chemical 306, which analyzes 55% U
and 1.6% P. (C.H.)

3424 A-4018

Kellex Corp., New York.

THE DETERMINATION OF URANYL ION BY DIRECT
TITRATION WITH CHROMOUS SULFATE. Robert H.
Lafferty, Jr., and Rasho Winget, Jr. Apr. 1, 1946. Decl.
Dec. 8, 1955. 6p. (Research Paper No. D23). $1.80(ph
OTS); $1.80(mf OTS).

A procedure is described for the direct potentiometric
titration of uranyl ion with chromous sulfate. The method
is said to determine between 100 and 500 mg of U with an
accuracy of 0.3% and a precision of 0.6%. There is no
interference from fluoride ion using this method. (C.H.)

3425 AECD-3850

Massachusetts Inst. of Tech., Cambridge, Metallurgical
Project.

SPECTROPHOTOMETRIC DETERMINATION OF SILICON
IN ZIRCONIUM. E. B. Read and J. P. Martin. Feb. 28,
1951. Decl. Dec. 6, 1955. 4p. Contract [W-7405-eng-53].
(MIT-EBR-8). $1.80(ph OTS); $1.80(mf OTS).

The spectrophotometric determination of Si in Zr is
based on the solubility of $SiCl_4$ in very dilute HNO_3 solution,
and the complexing of the fluorides with boric acid. The
optical density of the Si complex is measured at 710 mμ.
(C.W.H.)

3426 AECD-3991

Mallinckrodt Chemical Works, St. Louis.

THE DETERMINATION OF COPPER IN URANIUM MATE-
RIAL. J. Reed McCoy. Mar. 7, 1946. Decl. with deletions
Dec. 7, 1955. 8p. $1.80(ph OTS); $1.80(mf OTS).

A procedure is described which uses dithizone for the
colorimetric deterination of Cu in UF_4. The method
covers all phases of interference which are present in U
materials. Results of analyses are tabulated. (C.H.)

3427 CC-2403

[Ames Lab., Ames, Iowa.]

ANALYSIS FOR OXIDE IN THORIUM METAL. Problem
Assignment No. 7. A. S. Ayers. May 12, 1945. Decl.
Dec. 13, 1955. 4p. Contract W-7405-eng-82. $1.80(ph
OTS); $1.80(mf OTS).

To estimate the oxygen picked up by Th in casting, a
rapid method of running the acid insoluble content of the
metal was developed. The quickest procedure consists of
reacting with mixed acids, fuming with perchloric, and
filtration to separate the "free" thorium from the
"combined." The precipitate is ignited and weighed as
ThO_2. (auth)

3428 CC-2670

Chicago. Univ. Metallurgical Lab.

PRELIMINARY REPORT ON A COLORIMETRIC METHOD
FOR THE DETERMINATION OF MICROGRAM QUANTI-
TIES OF THORIUM. Problem Assignment 252 MLC
4407. W. Byerly, L. Niedrach, W. Davin, and H. Dyas.

EXPERIMENTS IN THE DISSOLUTION OF O_2 METAL
[UO_2]. Problem Assignment 251 MLC 4301. R. W. Bane.
Jan. 1, 1945. Decl. Dec. 16, 1955. 11p. Contract W-
7401-eng-37. $3.30(ph OTS); $2.40(mf OTS).

Thorium can be precipitated as a salt of p-dimethyl-
aminoazophenylarsonic acid at a pH of about 1.5. The
precipitate, collected on a sintered glass filter, is washed
with dilute ammonium hydroxide to dissolve the dye. The
amount of Th is determined by measuring the concen-
tration of the dye spectrophotometrically at a wavelength
of 450 millimicrons. Zirconium, which interferes, can be
separated and determined using the same reagent in strong
hydrochloric. The behavior of Th metal upon treatment
with various acids and upon fusion with $KHSO_4$ is de-
scribed. Three satisfactory procedures are given for
dissolving the metal with sulfuric acid, phosphoric acid,
and by a potassium hydrogen sulfate fusion. A study was
made of methods for the dissolutions of UO_2. Results are
summarized. (C.H.)

3429 CC-2933

[Ames Lab., Ames, Iowa.]

ANALYSIS OF IRON IN THORIUM, BERYLLIUM, AND
CERIUM. Problem Assignment No. 117. R. P. Ericson
and E. J. Fornefeld. Sept. 10, 1945. Decl. Dec. 16, 1955.
10p. Contract W-7405-eng-82. $1.80(ph OTS); $1.80(mf
OTS).

Procedures are summarized for the colorimetric
determination of Fe in Ce, Th, and Be metals and their
compounds. (C.H.)

3430 CC-2994

[Chicago. Univ. Metallurgical Lab.]

ANALYSIS OF HEAVY WATER BY EQUILIBRATION. R. B.
Fischer, R. A. Potter, and R. J. Voskuyl. May 15, 1945.
Decl. Dec. 15, 1955. 24p. Contract W-7401-eng-37.
$4.80 (ph OTS); $2.70(mf OTS).

The deuterium concentration of heavy water can be de-
termined by equilibrating the water with deuterium gas in
the presence of a catalyst with subsequent analysis of the
equilibrated gas on the mass spectrometer. The apparatus,
procedures, water sampling methods, the deuterium gas,
catalyst, peptizing agent, and reaction conditions are
described. The range, precision, and accuracy of the
method are discussed. An equation for calculating results
and a graph for routine calculation of results are appended.
(C.H.)

3431 CC-3241

[Ames Lab., Ames, Iowa.]

THE RAPID DETERMINATION OF NITRIC ACID AND
THORIUM IN THORIUM NITRATE SOLUTIONS. A. S.
Newton, J. Powell, and P. Figard. Nov. 27, 1945. Decl.
Dec. 14, 1955. 14p. Contract W-7405-eng-82.
$3.30(ph OTS); $2.40(mf OTS).

Two physico-chemical methods of determining nitric
acid and thorium nitrate in solutions containing these two
materials were investigated. Conductimetric titration with
sodium hydroxide can be used to determine nitric acid
accurately. The titration of thorium nitrate requires a
separate standardization of the base however, since a basic
salt is precipitated rather than the normal hydroxide. The
titration of thorium is reproducible however, so an em-
pirical standardization can be used. The measurement
of the specific gravity and refractivity of the solutions
provides a method of determining the concentrations in

terms of these two variables. Equations for the concentrations in terms of specific gravity and refractivity are given, both in pure solutions and in those saturated with methyl isobutyl ketone. (auth)

3432   CC-3638

Argonne National Lab., Lemont, Ill.

A STUDY OF THORIUM PEROXIDE SULFATE. J. W. Hamaker and C. W. Kock. Oct. 1, 1945. Decl. Dec. 15, 1955. 16p. Contract W-31-109-eng-38. $3.30(ph OTS); $2.40(mf OTS).

Thorium peroxide was precipitated from thorium nitrate solutions containing varying amounts of sulfate ion and of hydrogen ion. The washed solids were analyzed both wet and dry. Analyses were made for Th, peroxide oxygen, sulfate, nitrate, and water contents. X-ray powder photographs of the dried samples showed the presence of only two phases. When precipitated from high sulfuric acid, the solid phase was isomorphous with $ThOOSO_4 \cdot 3H_2O$. More weakly acid solutions whose sulfate content was varied over wide limits yielded a solid isomorphous with Th peroxide nitrate and containing 3.0 to 3.8 peroxide O atoms for each Th atom. The sulfate content of this latter phase varied continuously between the limits $SO_4^=/Th(IV)^= $ 0.34 to 0.01 with nitrate ion present when the sulfate content was very low. This continuous variation in composition is in agreement with the previously proposed structure of this phase. (auth)

3433   CF-48-10-219

[Oak Ridge National Lab., Tenn.]

SPECIAL RADIOISOTOPE METHODS. SECTION II. S. A. Reynolds. Sept. 20, 1948. Decl. Dec. 7, 1955. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Methods for the determination of Ba, Sr, Ce, Cs, Nb, the lanthanum group, Y, Pu, Am, Cm, the rare earths, and Zr are outlined. (B.J.H.)

3434   CN-2041

[Clinton Labs., Oak Ridge, Tenn.]

DEVELOPMENT OF RADIOCHEMICAL ANALYTICAL PROCEDURES FOR PLUTONIUM — (2) RECOMMENDATIONS FOR A STANDARD PROCEDURE AND TESTS IN URANYL SOLUTIONS. Progress Report. D. E. Koshland, Jr., comp. Jan. 8, 1945. Decl. Dec. 13, 1955. 39p. Contract W-7405-eng-39. $6.30(ph OTS); $3.00(mf OTS).

The development of procedures for the analysis of the total Pu in solution and the % Pu(VI) in solution is described. The variables affecting the choice of the procedures, the reproducibility of the procedures, and the finally recommended procedures are discussed in detail. (auth)

3435   DP-74

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

DETERMINATION OF ORGANIC MATERIAL IN AQUEOUS SOLUTIONS. E. R. Russell. Aug. 1954. Decl. Dec. 22, 1955. 17p. Contract AT(07-2)-1. $3.30(ph OTS); $2.40(mf OTS).

A method was developed for determining the concentration of trace quantities of organic material in aqueous solutions. The organic material is oxidized in solution, followed by gasometric measurement of the carbon dioxide. The technique may be applied to radioactive solutions, and as little as 0.3 of a micromole of carbon can be determined. (auth)

3436   DP-75

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

DIELECTRIC DETERMINATION OF TRIBUTYL PHOSPHATE IN KEROSENE. H. M. Hubbard. Aug. 1954. Decl. Dec. 22, 1955. 19p. Contract AT(07-2)-1. $3.30(ph OTS); $2.40(mf OTS).

The Sargent Model V Chemical Oscillometer was applied to the dielectric constant determination of tri-n-butyl phosphate (TBP) in mixtures of TBP and kerosene over the range of 0 to 10% TBP. Under the most favorable conditions, the precision approached 0.02% absolute. (auth)

3437   HW-13300

Hanford Works, Richland, Wash.

THE COULOMETRIC TITRATION OF 8-HYDROXYQUINOLINE. William N. Carson, Jr. June 16, 1949. Decl. Dec. 6, 1955. 16p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

A method of determining 8-hydroxyquinoline by titration with electrolytically generated Br_2 has been developed. Results show good precision in the range 0.4 to 1.6 mg total 8-hydroxyquinoline, with 99% confidence limits of less than ± 2%. An electronically-regulated constant current source, required by the method, is described. A new indicator system with high sensitivity to free Br_2 is discussed. (auth)

3438   HW-15846

Hanford Works, Richland, Wash.

A COMPARISON OF TWO METHODS FOR THE SPECTROCHEMICAL ANALYSIS OF PLUTONIUM. H. H. Van Tuyl. Feb. 1, 1950. Decl. Dec. 19, 1955. 13p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Spectrochemical analyses of plutonium by the carrier concentration and cupferron extraction—copper spark methods show diversities as high as a factor of fifty. Analysis by the direct copper spark method, analysis of thorium standards, and theoretical considerations all indicate that the carrier concentration method is more accurate than the cupferron method for all elements studied. (auth)

3439   HW-17175

Hanford Works, Richland, Wash.

THE DETERMINATION OF TRIBUTYL PHOSPHATE IN DEODORIZED SHELL BASE WITH THE INFRARED SPECTROMETER. R. H. Moore. Mar. 10, 1950. Decl. Dec. 22, 1955. 12p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

A preliminary investigation of an infrared spectrometer method for the determination of TBP in deodorized Shell base is reported. It was observed that small and variable amounts of water, HNO_3, and U have no adverse effect on the results. (J.E.D.)

3440   HW 18320

Hanford Works, Richland, Wash.

FISSION PRODUCT ANALYSIS OF URINE. R. C. Thorburn. May 31, 1950. Decl. Dec. 21, 1955. 19p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Detailed steps are outlined for the analysis of Sr^{89}, $Sr^{89}-Y^{90}$, $Ru^{106}-Rh^{106}$, Cs^{137}, and $Ce^{144}-Pr^{144}$ in urine by an ion exchange process. (K.S.)

3441   HW-30898

Hanford Atomic Products Operation, Richland, Wash.

THE FLAME PHOTOMETRIC DETERMINATION OF

CADMIUM IN CADMIUM-LEAD ALLOYS. D. W. Brite.
Feb. 19, 1954. Decl. Dec. 7, 1955. 11p. Contract W-31-
109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

A flame-photometric method was developed for a rapid
and accurate determination of Cd in Pb−Cd alloys, using
a Bechman Model DU Spectrophotometer. The method is
applicable throughout the entire range of 0 to 100% Cd,
with a lower limit of detection of 0.05% Cd. Relative
precision varies from ± 1.1% at 75% Cd level to ± 2.5%
at the 2% level. The time required for making a deter-
mination is about 20 min after an instrument calibration
has been made. (K.S.)

3442   K-81

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak
Ridge, Tenn.

AN IMPROVED APPARATUS FOR THE DETERMINATION
OF OXYGEN IN NITROGEN BY THE DEW POINT METHOD.
W. W. Harwood, T. Kwasnoski, and J. C. Barton. Nov. 20,
1947. Decl. Dec. 5, 1955. 10p. Contract [W-7405-eng-
26]. $3.30(ph OTS); $2.40(mf OTS).

Certain alterations and improvements in the gas-
cooling system have been made on the apparatus designed
for the determination of O_2 in tank N_2. The sensitivity was
improved in the concentration range of 0 to 100 ppm of O_2.
(C.W.H.)

3443   K-513

Carbide and Carbon Chemicals Corp. K-25 Plant,
Oak Ridge, Tenn.

CHEMICAL DECOMPOSITION OF SOLUTIONS OF AMMO-
NIUM NITRATE. S. S. Kirslis, T. S. McMillan, J. C.
Posey, and H. A. Bernhardt. Oct. 10, 1949. Decl. Dec.
27, 1955. 36p. Contract [W-7405-eng-26]. (KLO-148).
$6.30(ph OTS); $3.00(mf OTS).

Studies were made of a number of chemical methods for
the safe decomposition of ammonium nitrate in filtrates
from the uranyl ammonium phosphate precipitation from
Hanford waste solutions. Among the more successful
methods tested were the boiling out of ammonia after
addition of alkali; decomposition of ammonia to nitrogen by
means of sodium nitrite; reduction of nitrate by oxalic acid;
reduction of nitrate by a mixture of sucrose and formic
acid, and the decomposition of ammonium nitrate by
hydrochloric acid in the presence of silica gel. The alkali
method is simplest and presents the least corrosion dif-
ficulties. The organic reduction and the silica gel methods
require the use of strongly acid solutions, with attendant
corrosion problems, but result in an evaporated solid
residue only half as great as that from the alkali method.
Several other methods were investigated but were found
to possess greater practical disadvantages than the
methods described above. (auth)

3444   KAPL-210

Knolls Atomic Power Lab., Schenectady, N. Y.
THE DETERMINATION OF MOLYBDENUM IN URANIUM−
MOLYBDENUM ALLOYS: A COLORIMETRIC METHOD.
Eve Mosher and Richard H. Gale. July 7, 1949. Decl.
Dec. 5, 1955. 9p. Contract W-31-109-Eng-52. $1.80
(ph OTS); $1.80(mf OTS).

A modified thiocyanate method has been developed for
the determination of Mo in Mo−U alloys. Cupferron is
used to separate the U and Mo prior to the absorbance
measurements. Interfering ions include V^{5+}, Al^{3+}, and Fe^{3+}.
(C.W.H.)

3445   MCW-134

Mallinckrodt Chemical Works, St. Louis.
A COMPARISION OF RESULTS OF ORE ASSAYS BY MAL-
LINCKRODT AND NATIONAL BUREAU OF STANDARDS
PROCEDURES. J. R. Simmler and S. H. Huston. Sept.
1948. Decl. Dec. 2, 1955. 10p. $3.30(ph OTS); $2.40(mf
OTS).

A complete comparison of results of the ore assay
methods conducted by MCW and the National Bureau of
Standards as well as original assay results are tabulated.
Contrary to previous observations, the results of the MCW
method were consistently higher: fair agreement between
operators using both methods was noted. The investi-
gational assays did not generally agree well by either
method with the original values. The average deviation by
both methods was about 0.65%. (J.E.D.)

3446   NYO-5087

Mallinckrodt Chemical Works, St. Louis.
THE DETERMINATION OF CALCIUM IN IMPURE X [U]
LIQUORS. G. L. Martin. Mar. 3, 1945. Decl Dec. 2,
1955. 3p. $1.80(ph OTS); $1.80(mf OTS).

In connection with the development of the continuous ex-
traction process, it was necessary to determine Ca in
various liquors involved in the process. In addition to U,
these liquors contained phosphate, Fe, and rare earths in
varying amounts. The standard volumetric procedure in
which $KMnO_4$ is used to titrate Ca oxalate was chosen.
Several methods of separating the Ca from the interfering
ions were investigated. The method evolved consisted of
precipitating the Ca by adding NH_4OH to a hot acid solution
containing both the Ca and the oxalate. The detailed
analytical procedure is given. (L.M.T.)

3447   NYO-5130

Mallinckrodt Chemical Works, St. Louis.
DETERMINATION OF BARIUM IN AAA [PITCHBLENDE]
GANGUE. J. R. McCoy and G. L. Martin. July 11, 1945.
Decl. Dec. 7, 1955. 9p. $1.80(ph OTS); $1.80(mf OTS).

A method is developed for determining Ba in a sulfate
cake composed of large amounts of $PbSO_4$, $CaSO_4$, and
silicon. Ba is determined gravimetrically by means of a
$BaCrO_4$ precipitation following a suitable removal of all
the interfering elements. As a result of the interference of
trace amounts of Pb, the accuracy of this determination
can hardly exceed 5%. (K.S.)

3448   NYO-5134

Mallinckrodt Chemical Works, St. Louis.
THE RADIUM−URANIUM RATIO IN AAA [PITCHBLENDE]
ORE. G. L. Martin. July 1945. Decl. Dec. 7, 1955. 5p.
Contract [W-14-108-eng-8]. $1.80(ph OTS); $1.80(mf
OTS).

An attempt was made to establish the best value for the
theoretical ratio of Ra to U in pitchblende ore and a review
is made of the accuracy of the method. Results indicate
that the theoretical value for the Ra to U ratio is uncertain
within rather wide limits. The best available value seems
to be 3.68×10^{-7}. The average value obtained on 43 pitch-
blende ore samples submitted to the laboratory is $3.85 \pm
0.18 \times 10^{-7}$. Comparison of results obtained on check
samples and standard samples indicate that the results are
as accurate as can be expected, considering the inherent
inaccuracies of the method. Before the ratio in ore can be
fixed at any figure, it will be necessary to analyze samples
representing larger quantities of ore than those that were

run. Without knowing something of the history of the material, it is impossible to decide if the theoretical ratio can be applied to this material. (J.E.D.)

3449 NYO-5208
Mallinckrodt Chemical Works, St. Louis.
DETERMINATION OF URANIUM IN [BY-PRODUCT] BARIUM CAKE [SULFATE CAKE]. J. Boyd. Sept. 26, 1947. Decl. Dec. 2, 1955. 12p. $3.30(ph OTS); $2.40 (mf OTS).

The short acid digestion method (Black Book method) for determining U in by-product Ba cake does not give accurate results owing to the presence of interfering elements which are not removed by HNO_3 treatment. A revised technique, using aqua regia, is found to yield more accurate data. (K.S.)

3450 NYO-5210
Mallinckrodt Chemical Works, St. Louis.
THE RADIUM—URANIUM RATIO IN AAA [PITCH-BLENDE] ORE. III. F. A. Morecombe. Oct. 27, 1947. Decl. Dec. 2, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

No significant changes are made in the results reported in NYO-5134. (K.S.)

3451 NYO-5213
Mallinckrodt Chemical Works, St. Louis.
A STUDY OF ANALYTICAL METHODS FOR THE DETERMINATION OF URANIUM IN CHEMICAL 6 RP [ORE REFINERY RAFFINATE CAKE]. Gerald C. Reid. Dec. 18, 1947. Decl. Dec. 2, 1955. 13p. $3.30(ph OTS); $2.40(mf OTS).

An improved ether extraction procedure is given for the analysis of ore refinery raffinate cake, a hydroxide precipitate from the ether extraction, containing much $Ca_2(NO_3)_2$. The actual U content is determined to a degree of accuracy sufficient for material balance purposes. (K.S.)

3452 NYO-5214
Mallinckrodt Chemical Works, St. Louis.
THE DETERMINATION OF URANIUM IN PLANT [ORE REFINERY] SEWER WATER. O. J. Buckheim. Jan. 8, 1948. Decl. Dec. 2, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

A number of methods for U determination were tested, and satisfactory results were obtained by precipitating a minute quantity as a phosphate, using a coprecipitant. (K.S.)

3453 NYO-5217
Mallinckrodt Chemical Works, St. Louis.
DETERMINATION OF TRIVALENT URANIUM IN (URANIUM) DIOXIDE AND THE PREPARATION AND SOME PROPERTIES OF TRIVALENT URANIUM SOLUTIONS. J. R. Simmler. Jan. 21, 1948. Decl. Dec. 2, 1955. 10p. $3.30(ph OTS); $2.40(mf OTS).

Uranium dioxide dissolved in phosphoric acid under an atmosphere of carbon dioxide, and diluted with 25% sulfuric acid, did not have an initial high positive potential as compared to the high positive potential of samples of the same composition containing trivalent U. The trivalent U solutions can be prepared by reducing a solution of approximately 1% UO_2Cl_2 with zinc amalgam. The solutions of UO_2Cl_2 were reduced in 2.5%, 22.5% HCl and 22.5% H_2SO_4 concentrations. The U in the HCl solutions was almost completely reduced to the trivalent state. The U in the H_2SO_4 solution was not as completely reduced. Trivalent

U was titrated potentiometrically with ceric sulfate in different acid concentrations. The formation of hydrogen on the platinum indicator electrode had a disturbing effect on the potential readings. This effect was particularly true at the beginning of the titration and became less disturbing as the amount of trivalent U became less. The approximate reduction potential of trivalent U, using the normal oxidation potential of ceric/cerous couple as −1.61 volts, is +0.72 volts. (K.S.)

3454 NYO-5218
Mallinckrodt Chemical Works, St. Louis.
AN INVESTIGATION OF THE DETERMINATION OF HEXAVALENT URANIUM IN BROWN OXIDE [UO_2]. J. R. Simmler. Jan. 28, 1948. Decl. Dec. 2, 1955. 28p. $4.80(ph OTS); $2.70(mf OTS).

3455 NYO-5219
Mallinckrodt Chemical Works, St. Louis.
THE DETERMINATION OF URANIUM IN K-65 (GANGUE LEAD CAKE). John W. Stevenson. Jan. 1948. Decl. Dec. 2, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

The determination of 1 to 3% U in the presence of 1 to 3% Mo, V, Ba, Mg, Na, Sr, Ni, Ca, Co, Fe, and Zr, and much larger amounts of Pb, Si, Al, and sulfate ion was investigated. The two major problems are the extraction of U from the sample, and the isolation of the extracted U. Various analytical methods were applied, and the results indicated that the method in use is subject to both positive and negative errors. Positive errors may run as high as 15%. A recommended method is given which is believed to be free from these errors; however, a radical change in sample composition would warrant further investigation. The principal features of this method are multiple HNO_3 extractions from the sample and multiple ether extractions of the filtrates from the acid extractions. The final determination is made by a colorimetric $Na_2CO_3-H_2O_2$ method. (K.S.)

3456 NYO-5229
[Mallinckrodt Chemical Works, St. Louis].
A CHEMICAL AND SPECTROSCOPIC COMPARISON OF THE COPPER CONTENT IN CHEMICAL TA-7 [UF_4]. Joseph R. Simmler and Byron D. Field. May 1948. Decl. Dec. 2, 1955. 2p. $1.80(ph OTS); $1.80(mf OTS).

A series of UF_4 samples were prepared to which a known amount of Cu had been added giving a Cu range from 3 to 20 ppm. Chemical and spectrographic analysis of the UF_4 samples were compared and any difference, especially in the Cu content, was noted. The two methods were in fair agreement. (K.S.)

3457 NYO-5230
Mallinckrodt Chemical Works, St. Louis.
SOLUTION PROCEDURE OF PITCHBLENDE AS USED BY THE NATIONAL BUREAU OF STANDARDS. Joseph R. Simmler. May 1948. Decl. Dec. 7, 1955. 3p. $1.80 (ph OTS); $1.80(mf OTS).

Steps are outlined for dissolving small samples of pitchblende into solution, and analyzing for U content by a fusion procedure. Results indicate that complete dissolution of the U ore is obtained by this procedure. (K.S.)

3458 NYO-5236
Mallinckrodt Chemical Works, St. Louis.
THE SPECIFIC GRAVITY OF DILUTE SOLUTIONS OF URANIUM IN ETHER. Gerhard P. Lang. Nov. 6, 1950. Decl. Dec. 2, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

The specific gravity of dilute solution of $UO_2(NO_3)_2$ in ether was used for the determination of U in the ether from column A-3. The specific gravity measurements are tabulated. (J.E.D.)

3459 Y-390

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
COLORIMETRIC DETERMINATION OF URANIUM AND VANADIUM WITH BENZOHYDROXAMIC ACID. L. G. Overholser and W. R. Grimes. April 20, 1949. Decl. Dec. 6, 1955. 55p. Contract W-7405-eng-26. $9.30 (ph OTS); $3.60(mf OTS).

The reaction of benzohydroxamine acid with uranyl ions was investigated and the reaction was applied to the colorimetric determination of U. Various factors such as effect of pH, reagent and buffer concentration, temperature, and the effect of diverse ions were studied. Comparable work, on the reaction of benzohydroxamic acid with vanadate ions, was performed and a colorimetric method was developed for V. The colorimetric methods were applied to U and V in mixtures containing also Fe, Al, Cu, Ni, Co, Cr, and Mn. Results of such determinations, following separations by the Hg cathode, penta-ether, phosphate, and cupferron methods, are given. Results of similar determinations in carnotite ores are also presented. (auth)

3460 Y-407

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
THE FLUORESOMETER. Stanton B. Smith and Hugh G. Neil. Jan. 29, 1946. Decl. Dec. 7, 1955. 25p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

The fluoresometer Model 2B has been in daily use for determining U in urine samples for a period of six months and has given very satisfactory performance. The sample is fused in a cake of sodium fluoride 0.75 in. in diameter and 1 mm thick (300 milligrams). This cake is activated with ultraviolet light from an S-4 sunlamp and the fluorescence measured by means of a phototube and sensitive DC amplifier. The range of the instrument is 6 micrograms to 0.001 micrograms, results being reproducible from the same sample to within 1% at the high end and to within 10% at the low end of the range. The zero stability is better than one-half of one percent. (auth)

3461 Y-602

Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
CHEMICAL DETERMINATION OF PHTHALATE ION. L. G. Overholser and W. R. Grimes. Apr. 17, 1950. Decl. Dec. 8, 1955. 26p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

A method for determination of phthalate ion in aqueous solution by precipitation at pH 3.3 of a lead phthalate compound of constant composition has been developed. Subsequent drying of the precipitate at 105°C and weighing of the material permits estimation of phthalate present to ±1%. Chloride and thiocyanate ions, if present to the extent of more than 5 millimoles per sample, should be removed by precipitation with Ag. The material is not, in spite of previously reported data, the normal Pb phthalate but its composition is sufficiently reproducible to justify its use in analysis. The presence of 1 mole of acetate ion per 2 moles of phthalate ion in the dried precipitate has been demonstrated. The weight of precipitate obtained from a known quantity of phthalate and the Pb content of the dried material justify the conclusion that the compound precipitated is $Pb(C_2H_3O_2)_2 \cdot 4PbC_8H_4O_4$. (auth)

Refer also to abstracts 3515, 3535, and 3567.

DEUTERIUM AND DEUTERIUM COMPOUNDS

3462 A-754

Columbia Univ., New York. Div. of War Research.
EXCHANGE OF DEUTERIUM BETWEEN MERCAPTANS AND WATER. Clyde Hutchison and Daniel Gillies. July 9, 1943. Decl. Dec. 8, 1955. 40p. Contract W-7405-eng-50. (2R-238). $6.30(ph OTS); $3.00(mf OTS).

Isopropyl mercaptan was investigated as a possible substance for use in the extraction of deuterium from water by the dual temperature process. Data are presented from studies on the equilibrium separation coefficients for the exchange of D between water and mercaptans at various temperatures; the rates of exchange of D between mercaptans and water; the settling rates of water-mercaptan emulsions; the solubility of isopropyl mercaptan in water and the solubility of water in isopropyl mercaptan; the corrosive action of mercaptans on steel; and the hydrolysis of alkaline solutions of isopropyl mercaptan. (C.H.)

3463 A-3954

National Bureau of Standards, Washington, D. C.
VISCOSITY OF DEUTERIUM OXIDE FROM 5° TO 95°C. R. C. Hardy and R. L. Cottington. [194?]. Decl. Dec. 8, 1955. 6p. $1.80(ph OTS); $1.80(mf OTS).

Data are presented on the absolute viscosity of deuterium oxide of 99.56 mol % purity over the range 5 to 95°C, and on the absolute viscosity of pure deuterium oxide and distilled water over the same temperature range. A table is given showing values for the ratios of the viscosity of pure deuterium oxide, deuterium oxide of 99.56 mol % purity, and water, at various temperatures to the viscosity of water at 20°C. The table also contains values for the ratio of the viscosity of pure deuterium oxide and deuterium oxide of 99.56 mol % purity at various temperatures to the viscosity of water at the same temperature. (auth)

3464 K-843

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
EVALUATION OF HEAVY WATER PRODUCTION AT GASEOUS DIFFUSION PLANT SITES. S. Blumkin, R. W. Dehoney, and J. Shacter. Nov. 26, 1951. Decl. Dec. 27, 1955. 16p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The production of heavy water by distillation, utilizing heat available from other process sources—specifically at a gaseous diffusion site—is discussed. The high temperature-high pressure process, because of the low relative volatility, requires a very large and costly cascade of distillation columns. The low temperature-low pressure process, involving larger relative volatility, appears to be more economical. On a quick design basis, neither process can furnish heavy water at unit costs which compete with those predicted for other methods of separation. (auth)

Refer also to abstract 3735.

FLUORINE AND FLUORINE COMPOUNDS

3465 A-740

Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

PRODUCTION OF FLUORINATED LUBE OIL. Problem Report. R. G. Benner. May 7, 1943. Decl. Dec. 7, 1955 34p. (100XR-1353) $6.30(ph OTS); $3.00(mf OTS).

One hundred and fifteen pounds of distilled fluorinated lube oil with a boiling range of 147 to 208°C/10 mm was prepared by the vapor phase fluorination method. In addition enough crude oil was made to produce 12 gal or 204 lb more of this material. Procedures are described and properties of the cuts are tabulated. (C.H.)

3466 A-2553

Du Pont de Nemours (E. I.) and Co. Jackson Lab., [Wilmington, Del.]

THE CONTROL OF THE HF CONCENTRATION OF ELECTROLYTE BY ELECTRICAL CONDUCTANCE MEASUREMENTS. Problem Report [for] Period February 23, 1944 to November 27, 1944. S. G. Turnbull, Jr. Jan. 11, 1945. Decl. Dec. 13, 1955. 40p. Contract W-7412-eng-151. (JWD-40) $6.30(ph OTS); $3.00 (mf OTS).

The control of the HF concentration of electrolyte in fluorine production units is compared with other methods of HF control. Absolute values for the specific conductance of electrolyte are given, and their dependence upon the HF content and the temperature are discussed. The design of conductance cells for controlling the HF content of electrolyte is discussed from theoretical and constructional viewpoints. The effects of errors that occur in the conductance method are described, and methods for reduction of these to negligible quantities are prescribed. Among these may be mentioned the errors resulting from the contact resistance of electrodes, frequency effects, and errors due to dissolved iron or water. The results of control runs using this method of measurement are described for conductance cells of various design. (auth)

3467 M-4556

Du Pont de Nemours (E. I.) & Co., Wilmington, Del.

FINAL REPORT ON BPX-6. LOW TEMPERATURE CONDENSATION OF HF FROM FLUORINE. W. J. Cordes. Sept. 21, 1945. Decl. Dec. 6, 1955. 39p. $7.80(ph OTS); $3.30(mf OTS).

Fluorine produced in the nickel-anode electrolytic cells contains about 25% HF as an impurity which caused process difficulties. In an effort to reduce process difficulties HF has been experimentally condensed in a shell-and-tube condenser using a dry ice-trichlorethylene mixture as coolant. It was demonstrated that the HF concentration in the fluorine could be reduced to about 5%. Heat transfer coefficients and other design data were obtained. (auth)

3468 M-4558

Du Pont de Nemours (E. I.) & Co. Engineering Dept., Wilmington, Del.

MEASUREMENT OF FLUORINE CELL BUILDING PRODUCTION AND EFFICIENCY; REMOVAL AND RECOVERY OF HF FROM HYDROGEN. Final Report on BPX-2. W. O. Jewett and J. D. Ensign. June 27, 1944. Decl. Dec. 5, 1955. 57p. (CWC-ED-1). $9.30(ph OTS); $3.60(mf OTS).

Methods were determined for purifying and metering the by-product hydrogen manufactured in electrolytic fluorine cells. The metered hydrogen was used as a current efficiency measurement of the cells and was recovered for use in hydrogenation processes. Hydrofluoric acid present in the hydrogen as it came from the cells was removed by scrubbing the hydrogen with water and caustic or by adsorption on activated carbon. The latter method allowed it to be re-used in the cell operation. (auth)

Refer also to abstract 3414.

GRAPHITE

3469 BNL-69

Brookhaven National Lab., Upton, N. Y.

THERMAL CONDUCTIVITY OF GRAPHITE. R. C. Garth and V. L. Sailor. Nov. 28, 1949. Decl. Jan. 6, 1956. 19p. Contract [AT-30-2-gen-16]. $3.30(ph OTS); $2.40(mf OTS).

The coefficient of thermal conductivity of several samples of graphite used in BNL reactors has been measured. The conductivity in the direction parallel to the axis of extrusion was higher than in transverse directions. The effect of mechanical mistreatment was to decrease the conductivity. The heat transfer coefficient for machined surfaces of graphite was also measured. (auth)

3470 CC-3161

Carnegie Inst. of Tech., Pittsburgh.

THE EFFECT OF NEUTRON BOMBARDMENT ON THE SPECIFIC HEAT OF GRAPHITE AT LOW TEMPERATURES. Report for Period Aug. 1, 1944, to June 30, 1945. ("A" Report No. 13). I. Estermann and G. I. Kirkland. Sept. 5, 1945. Decl. Dec. 15, 1955. 31p. Contract W-7405-eng-277. $6.30(ph OTS); $3.00(mf OTS).

Results are reported from a preliminary study of the effect of neutron bombardment on the specific heat of graphite at low temperatures. Theoretical considerations are reviewed. Results are reported from a series of measurements of the effects of bombardment or annealing on the specific heat at various temperatures. It was found that a strongly bombarded specimen had a higher specific heat than a virgin one, and that annealing at 500°C reduced the specific heat of the bombarded piece. (C.H.)

3471 CE-364

Chicago. Univ. Metallurgical Lab.

EROSION OF GRAPHITE BY STEEL SHOT. A. W. Simon. Dec. 2, 1942. Decl. Dec. 15, 1955. 4p. (A-419). $1.80(ph OTS); $1.80(mf OTS).

Preliminary experiments were undertaken to determine the amount of erosion produced when #8 steel shot passed through a 2-in diameter boring in a graphite block 15 in. long. The velocity of the shot was reduced by means of orifice plates with apertures of 1 and 1½ in. respectively, placed at the outlet of the block. The shot was circulated by means of a pneumatic conveyor. It was found that with the 1 in. aperture in place, conditions of uniform "flow" of shot with a velocity of 2.6 inches per second were produced, and that under these conditions there was negligible erosion after 8 hours of operation; on the other hand, with the 1½ in. aperture in place conditions approximating "free fall" with a maximum possible velocity of 20.2 ft. per second (actual velocity reduced by collisions) were produced, and that under these conditions

there was considerable erosion after 4 hours of operation. It is concluded that if it were necessary to use the process employing circulating uranium shot, it might be possible to find conditions under which the erosion could be reduced to a minimum. (auth)

3472 KAPL-789

Knolls Atomic Power Lab., Schenectady, N. Y.
MEASUREMENTS OF THERMAL CONDUCTIVITY ELECTRICAL RESISTIVITY AND THERMOELECTRIC POWER OF GRAPHITE. W. W. Tyler and A. C. Wilson, Jr. July 24, 1952. Decl. Dec. 6, 1955. 54p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

The thermal conductivity, electric conductivity, and thermoelectric power were measured in the temperature range from 20 to 300°K for samples of CSF graphite, AGOT graphite, lampblack graphite, natural molded graphite, and two samples of pile-irradiated CSF graphite. The results of these measurements are presented and discussed briefly in relation to theory. (C.H.)

3473 Y-149

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
PURIFICATION OF GRAPHITE: INITIAL STUDIES. W. L. Ross and C. B. Graham. Mar. 10, 1948. Decl. Dec. 8, 1955. 15p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

An experiment is described in which it was determined that the impurities in C-18 graphite can be almost completely eliminated. The process involves vapor phase chlorination of the graphite with chlorine gas at approximately 1800°C. It was found that good purification was attained by using a sweep flow of gases through the reactor. (auth)

Refer also to abstracts 3738 and 3810.

LABORATORIES AND EQUIPMENT

3474 AECD-3865

Hanford Works, Richland, Wash.
THE HANFORD POLAROGRAPH. William N. Carson, Jr. April 14, 1949. Decl. Dec. 5, 1955 13p. Contract [W-31-109-eng-52]. (HW-R-13051). $3.30(ph OTS); $2.40(mf OTS).

The Hanford Polarograph measures the current at two points, one above the halfwave potential and one below the halfwave potential, on the current-voltage curve (polarogram) obtained from a polarographic cell. The difference in these values, less a constant residual current experimentally determined, comprises the diffusion current. The operation of the polarograph has been simplified so that a determination of the diffusion current can be made in two minutes. Comparison of the curves, diffusion current vs. concentration, obtained from the Hanford polarograph and a Sargent Model XXI polarograph on the same solutions shows no significant difference. (auth)

3475 CF-51-10-97

Oak Ridge National Lab., Tenn.
OPERATING MANUAL—INSTRUMENTS. C. B. Amberson and A. M. Larson. Oct. 4, 1951. 135p. Decl. Dec. 19, 1955. 135p. Contract [W-7405-eng-26]. $21.30(ph OTS); $6.90(mf OTS).

An operating manual is given for the instrumentation

for recording and controlling the process variables in remotely controlled equipment of radiochemical processing plants. (B.J.H.)

3476 K-39

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.
USE OF THE LINE RECORDER AS A HELIUM LEAK DETECTOR. N. H. Pease. Sept. 10, 1947. Decl. Dec. 5, 1955. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Experiments were conducted with the line recorder main magnet shunted to determine if the He peak could be detected with high enough sensitivity so that He leak testing of cells could be accomplished from the operating floor. Weakening of the magnetic field by means of a shunting piece of iron reduces the voltage needed to resolve the mass 4 peak to a value which may be obtained from the high voltage supply. The tests made show that the He peak could be observed, but even if the sensitivity of the line recorder were increased by all known practical means it could not equal the sensitivity of the G.E. Leak Detector. (auth)

3477 KLX-1356

Kellex Corp., New York.
PROJECT COMPLETION REPORT; THOMPSON QUICK DISCONNECT DEVELOPMENT. Job 24-B3. E. W. Ruhl. Aug. 16, 1951. Decl. Dec. 5, 1955. 26p. Contract AT(30-1)-850. $4.80(ph OTS); $2.70(mf OTS).

The development, prototype production, and testing of a modified Thompson Quick Disconnect for use in radiochemical process lines is discussed. A 1-in. pipe connector has been developed for use where highly corrosive radioactive fluids are transferred under limited temperature conditions. (auth)

RADIATION CHEMISTRY

3478 AECD-3807

Knolls Atomic Power Lab., Schenectady, N. Y.
GAMMA-INDUCED LIGHT PRODUCTION IN WATER. J. A. Rich and R. E. Slovacek. Sept. 19, 1952. Decl. with deletions Dec. 5, 1955. 32p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

The mechanism of light production in H_2O is shown to be due predominantly to the Cherenkov process. Measurement of the radiant flux was carried out for "infinite volume" and for spherical volumes of H_2O of different radii. (auth)

RADIATION EFFECTS

3479 AECD-3810

North American Aviation, Inc., Downey, Calif.
RADIATION EFFECTS QUARTERLY PROGRESS REPORT [FOR] APRIL—JUNE 1954. Frank E. Faris, ed. Nov. 1, 1954. Decl. with deletions Dec. 6, 1955. 52p. Contract AT-11-1-GEN-8. $9.30(ph OTS); $3.60(mf OTS).

Two theories on the anomalous low temperature thermal conductivity of graphite were tested by measurements with a single graphite crystal. It was concluded that the conductivity has a T^2 dependence at low temperature, and that the T^3 dependence is explained by a two-medium theory involving intergranular C. The theoretical treatment of the two-medium theory is extended from previous studies to

include the effect of neutron damage on several artificial graphites, as well as the effect of bromination. An apparatus was constructed for measuring the magnetic susceptibility of solids at liquid-N_2 temperatures. Results for graphite are presented. Another device was designed for measuring the temperature dependence of thermal conductivity, electrical resistivity, and thermoelectric power for cyclotron-irradiated graphite. Graphical results for a temperature range of 5 to 300°K are given. Previously determined power and electrical resistivity of graphite at −180°C and −190°C, respectively, are compared for irradiations made at +35, −94, and −170°C. Several determinations were made of the activation energy for the room-temperature annealing state of cyclotron-irradiated iodide-processed Th. The tensile properties of this material were measured at 77 and 295°K. Potassium chloride crystals colored in Na vapor were analyzed, and it was found that no Na was present in the interior of the crystal. The absorption spectrum, however, showed a new band that is found only in KCl colored by Na. The nature of this band is not clear, although it occurs in a region in which N-band structure in radiation-damaged crystals occurs. (K.S.)

3480   CC-1321

Chicago. Univ. Metallurgical Lab.

THE EFFECT OF RADIATION ON WATER AND AQUEOUS SOLUTIONS OF INORGANIC SUBSTANCES. A. O. Allen. Feb. 22, 1944. Decl. Dec. 15, 1955. 29p. (A-1874) $4.80 (ph OTS); $2.70(mf OTS).

Electrons and x rays dissociate water through ionization into oxidizing and reducing fragments, which probably have the formulas OH and H. In the absence of any solute, the fragments recombine and no net reaction occurs. If any oxidizable or reducible substance is dissolved in the water, it will react with the fragments, becoming oxidized or reduced. Thus, oxygen dissolved in the water is reduced to hydrogen peroxide, and ferrous, arsenite and other reducing ions are oxidized with the formation of an equivalent amount of hydrogen gas. Iodide and bromide ions sensitize the decomposition of water to hydrogen peroxide and hydrogen; bicarbonate ion and CO_2 also yield a peroxide, which may be percarbonic acid. The amount of reaction occurring for a particular exposure is (in the absence of complicating chain reactions) independent of the concentration of solute, at least above 10^{-4} M, and probably also independent of the nature of the solute, being fixed only by the number of ionizations produced by the radiation. To produce one chemically effective ionization in liquid water appears to require the absorption of about 80 ev of energy from the radiation. Heavy ionizing particles, including protons (recoils produced by action of neutrons passing through the water), deuterons, alpha particles and fission recoils, act on water directly to form hydrogen and hydrogen peroxide, which in turn decomposes to yield oxygen. If anything is dissolved in the water, the decomposition reaction is superimposed on the oxidation-reduction reactions of the solute. The kinetics and the mechanism of the decomposition are rather obscure; the back-reaction of the dissolved products, hydrogen and oxygen, to re-form water appears to play an important role. Corrosion of aluminum and of other metals is not greatly affected by radiation, at least in all experiments made to date. (auth)

SEPARATION PROCEDURES

3481   AECD-3859

[Tennessee Eastman Corp., Oak Ridge, Tenn.]

THE EFFECT OF TEMPERATURE ON THE DISTRIBUTION OR NITRIC ACID BETWEEN DIBUTYL CARBITOL AND AQUEOUS SOLUTIONS OF COPPER NITRATE. C. D. Shacklett and W. J. Wilcox, Jr. Jan. 17, 1946. Decl. Dec. 3, 1955. 12p. (CD-954-14). $3.30(ph OTS); $2.40 (mf OTS).

At a constant acidity in the aqueous phase, the distribution coefficient K_d (where K_d = [acid]$_{carbitol}$ / [acid]$_{aqueous\ Cu(NO_3)_2}$ decreases as the temperature is increased; at a constant temperature K_d increases as the density of the aqueous phase is increased. (C.W.H.)

3482   AECD-3905

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.

ANALYSIS OF ZIRCONIUM PURIFICATION COLUMNS. E. I. Goodman, R. F. Abbanat, A. G. Bates, and D. C. Lea. Dec. 16, 1950. 42p. Decl. Dec. 7, 1955. (KT-104). $7.80(ph OTS); $3.30(mf OTS).

Operating characteristics of three spray columns, the extractor, stripper, and scrubber, in the zirconium solvent-extraction pilot plant are given. Variables affecting the Hf−Zr separation are discussed. (C.W.H.)

3483   CC-264

[Clinton Labs., Oak Ridge, Tenn.]

THE EXTRACTION METHOD OF PURIFICATION OF URANYL NITRATE. L. S. Myers, Jr., E. C. Anderson, Sol Wexler, and G. E. Boyd. Aug. 28, 1942. Decl. Dec. 13, 1955. 9p. (A-295). $1.80(ph OTS); $1.80(mf OTS).

Three extractions of a diethyl ether solution of uranyl nitrate with small portions of water are effective in removing rare earths, as is shown by radio-gadolinium and radio-europium tracer experiments. A study of representative ethers, alcohols, ketones, and esters showed that diethyl ether and a mixture of 85% ethyl methyl ketone with 15% xylene are the best solvents for the extractions. At 25°C a saturated diethyl ether solution is 1.8 molar, and a similar solution in the ketone-xylene mixture is 2.0 molar. An empirical relation for the distribution ratio between ether and water is $K = C_S/C_W^{3.3} = 0.20$ where C_S is the equilibrium concentration in the ether layer of the uranyl nitrate, and C_W that in water. A similar equation for the ketone-xylene mixture is $K = C_S/C_W^{1.24} = 0.60$. Di-ethyl ether gives the better extraction. Sodium chloride, sodium nitrate, and uranyl chloride have no deleterious effect on the extraction. However, more than four ml of nitric acid per hundred ml of saturated ether solution reduce the efficiency of the extraction in removing UX. (auth)

3484   CC-2401

[Ames Lab., Ames, Iowa].

A METHOD OF RECOVERING THORIUM FROM SLAG MATERIALS. Problem Assignment No. 16. Oliver Johnson and R. W. Fisher. Mar. 23, 1945. Decl. Dec. 13, 1955. 7p. Contract W-7405-eng-82. $1.80(ph OTS); $1.80(mf OTS).

A method of recovering thorium from slag from the bomb process of producing thorium has been developed. HCl and NaOH are the only chemicals required in quantity. Materials required for a representative slag are given. (auth)

3485 CC-2962

[Ames Lab., Ames, Iowa].

PRECIPITATION OF THORIUM OXALATE FROM NITRIC ACID SOLUTIONS. Problem No. 117. A. S. Ayers. Oct. 5, 1945. Decl. Dec. 15, 1955. 5p. Contract W-7405-eng-82. $1.80(ph OTS); $1.80(mf OTS).

Data are reported from a study of factors affecting the precipitation of Th oxalate from nitric acid solutions. (C.H.)

3486 CF-51-7-120

[Oak Ridge National Lab., Tenn.]

PERFORMANCE OF HOT COPPER WHEN USED FOR THE REMOVAL OF OXYGEN AND OXIDES OF NITROGEN FROM A GAS STREAM. H. O. Weeren. July 18, 1951. Decl. Dec. 16, 1955. 35p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

An investigation was made of the efficiency with which a heated Cu bed will remove oxygen and the oxides of nitrogen from gas mixtures at various temperatures and flow rates. Mixtures of NO and N, N_2O and N, and O and N were fed to chemical reactor at various flow rates and at different reactor temperatures. The effectiveness with which hot Cu removed the O and oxides of N was measured. Calculations based on the findings indicated that 1500 lb of Cu would be required to remove the O and N oxides from the gases passing during one day through the dissolver off-gas system of the Arco Chemical Processing Plant. Consideration of this method for removal of nitrogen oxides at the Arco plant was abandoned. (C.H.)

3487 CF-51-10-28

[Oak Ridge National Lab., Tenn.]

PUREX PROCESS. VAPOR PRESSURE OF AMSCO 123-15 AND OF 30% TBP IN AMSCO 123-15. L. E. Line, Jr. Oct. 3, 1951. Decl. Dec. 15, 1955. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Since Amsco 123-15 diluent is a potential industrial hazard, the vapor pressures of 100% Amsco 123-15 and 30% tributyl phosphate − 70% Amsco 123-15 were determined over the range 20 to 185°C. Data are tabulated and graphed. (C.H.)

3488 CF-52-2-164

Oak Ridge National Lab., Tenn.

ADSORPTION OF FISSION PRODUCTS ON STAINLESS STEEL IN IAW SOLUTION AND SUBSEQUENT DESORPTION. Quarterly Report for Period November 10, 1951 − February 10, 1952. M. R. Bennett. Feb. 18, 1952. Decl. Dec. 15, 1955. $1.80(ph OTS); $1.80(mf OTS).

The adsorption equilibrium on stainless surfaces for all fission products other than niobium was established within six hr with a specific adsorption activity of approximately 7.0×10^4 c/m/in.^{2} gross β^-. Approximately 75% of the total β activity adsorbed within the first 12 hr was due to Zr-Nb; 15% was due to TRE, and 6% was due to Ru, Cs, and Zr. The adsorption equilibrium for fission products on Type 347 stainless steel appears to be slightly higher than for Type 309, by a factor of 1.05 to 1.08. Results are tabulated. (auth)

3489 CF-53-1-283

Oak Ridge National Lab., Tenn.

DEVELOPMENT OF DECONTAMINATION REAGENT. Quarterly Report for Period November 1, 1952 to February 1, 1953. M. L. Feldman and R. F. Rogers.

Jan. 26, 1953. Decl. Dec. 16, 1955. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Procedures were evaluated for the decontamination of stainless steel. One criterion was that the pH of the final waste solutions must be high or neutral. Results are tabulated which were obtained by decontamination with 15 solution treatments. Solutions and procedures are also tabulated. The method of choice consists of 6.1$\underline{M}$ NaOH − 1$\underline{M}$ $Na_2C_4H_4O_6$ used at 85°C for 0.5 hr with vigorous agitation followed by 1$\underline{M}$ $H_2C_2O_4$ − 0.1$\underline{M}$ NaF under the same conditions. This procedure should be repeated. (C.H.)

3490 CNL-41

Clinton National Lab., Oak Ridge, Tenn.

THE BEHAVIOR OF RUTHENIUM UNDER SOLVENT EXTRACTION. G. R. B. Elliott and F. T. Miles. Feb. 27, 1948. Decl. Dec. 20, 1955. 30p. Contract W-35-058-eng-71). $4.80(ph OTS); $2.70(mf OTS).

Studies were carried out to help understand the two-phase distribution behavior of ruthenium. Distribution data are presented. It was found that the distribution behavior could be explained by four forms of ruthenium and various equilibrium constants and reaction rates. Estimates of these values are given and a possible assignment of states is suggested. (auth)

3491 K-447

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

SEPARATION OF COPPER, IRON, NICKEL AND URANYL IONS BY ION EXCHANGE COLUMNS. H. L. Bench, R. H. Capps, M. R. Skidmore, H. B. Weisblatt, and R. H. Winget. July 20, 1949. Decl. Dec. 27, 1955. 32p. (KLO-127). $6.30(ph OTS); $3.00(mf OTS).

The adsorption and elution characteristics of Cu, Fe, Ni, and uranyl ions on Dowex 50 synthetic exchange resin were studied with small columns. It was found possible to separate Cu and Ni from U adsorbed on a column of the Na form of Nalcite high capacity exchange resin (Dowex 50) using 5% ammonium citrate as an elutriant at pH 7, followed by the same elutriant at pH 3. Of the total U in the mixture, 83% was recovered in 160 ml of eluate. Sixty-six % was recovered free of contamination in 70 ml, 60% being concentrated in a 20 ml fraction of eluate. (auth)

3492 M-2327

Purdue Univ., Lafayette, Ind.

REMOVAL OF ETHER PEROXIDES FROM DIETHYL ETHER BY EXTRACTION WITH CERTAIN AQUEOUS SOLUTIONS. A. A. Alberts. Mar. 21, 1946. Decl. Dec. 5, 1955. 9p. Contract W-7405-eng-74. $1.80(ph OTS); $1.80(mf OTS).

An investigation was made to determine the effect produced upon the concentration of other peroxides in diethyl ether by extraction with various solvents. These data can be used to show the probability of ether peroxide formation during a continuous extraction process involving diethyl ether. (J.E.D.)

3493 M-4241(Pt.III)

Princeton Univ., N. J. Frick Chemical Lab.

A METHOD FOR THE DETERMINATION OF TRACES OF METALS. III. STUDIES OF THE DISTILLATION OF AMALGAMS. C. E. Bricker, N. H. Furman, and Bruce McDuffie. 1946. Revised Oct. 1947. Decl. Dec. 5, 1955. 9p. $1.80(ph OTS); $1.80(mf OTS).

Successful recovery of milligram quantities of Cd, Co, Fe, Ni, Cu, and Zn from amalgams was achieved by distillation in a N_2 atmosphere. (K.S.)

3494   M-4483

[National Bureau of Standards, Washington, D.C.] PROGRESS REPORT NO. 4 ON THE SEPARATION OF ZIRCONIUM FROM HAFNIUM. [194?]. Decl. Nov. 29, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

Preliminary investigations indicate that a freshly prepared precipitate of $Zr_3(PO_4)_4$, when agitated in an entirely different solution from which it was formed had the property of removing Hf to a certain extent. (auth)

3495   RL-4.6.151

[California. Univ., Berkeley. Radiation Lab.] THE HYPOSULFITE-pH CONTROL METHOD OF TUBALLOY [U]–IRON SEPARATION. E. L. Wagner. June 3, 1943. Decl. Jan. 5, 1956. 9p. $1.80(ph OTS); $1.80(mf OTS).

The procedure consists of the following steps: reduction of UO_2^{2+} and Fe^{3+} with $(NH_4)_2SO_4$ to U^{4+} and Fe^{2+}; precipitation with NH_4OH of $U(OH)_4 - U(SO_3)_2$ at pH 4.5, leaving the Fe^{2+} in solution. (K.S.)

3496   UCRL-861

California. Univ., Berkeley. Radiation Lab. ALKYL PHOSPHORIC ACID EXTRACTIONS. D. C. Stewart and T. E. Hicks. Aug. 9, 1950. Decl. Dec. 7, 1955. 40p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

Organic solvent extraction techniques were used to separate the mono- and di-alkyl substituted commercial phosphoric acid mixtures. Extraction coefficients and titration curves for several systems are presented. Tracer quantities of U^{233} were extracted by the separated acids. The equilibrium extraction reaction for the moderate-to-high initial-acid systems is proposed. Tracer U^{233} extractions by TBP seemed to verify previous studies of the same system by other laboratories. Tracer Pu^{239} extraction by dibutyl phosphoric acid from HNO_3 solutions are presented. Some preliminary experiments on the separability of U^{233} and Pu^{239}, by alkyl phosphoric acid extraction, were undertaken and the data presented. (auth)

Refer also to abstract 3566.

SORPTION PHENOMENA

3497   K-372

Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn. ABSORPTION OF SILICON TETRAFLUORIDE BY ACTIVATED ALUMINA. A. D. Horton and S. S. Kirslis. Mar. 23, 1949. Decl. Dec. 5, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The absorption of SiF_4 on activated alumina was determined in the temperature range from 22.5 to 575°C. At each temperature, a mixture of 1% SiF_4 and 99% N was passed through two Pregl absorption tubes, each containing 2 g of alumina, for 2 hr at a flow rate of 40 ml/min. Absorption of SiF_4 was complete at each temperature when 4 g of absorbent were used. Absorption with 2 g of absorbent was found to be incomplete, but it became more complete at higher temperatures. Rapid, complete condi-

tioning of activated alumina was achieved by heating in a Pt container at 750°C for three hr. (auth)

SYNTHESES

3498   A-796

Columbia Univ., New York. Div. of War Research. PREPARATIVE METHODS. H. I. Schlesinger. Feb. 1943. Decl. Dec. 8, 1955. 12p. Contract OEMsr-368. (100XR-158). $3.30(ph OTS); $2.40(mf OTS).

Procedures are summarized for the preparation of uranium borohydride; aluminum borohydride; methyl borate; sodium trimethoxyborohydride; diborane; lithium borohydride; and sodium borohydride. Apparatus used is illustrated. (C.H.)

TRANSURANIC ELEMENTS AND COMPOUNDS

3499   ANL-4654

Argonne National Lab., Lemont, Ill. AN INTERIM REPORT ON STUDIES OF THE THERMIONIC PROPERTIES OF SURFACES CONSISTING OF PLUTONIUM ATOMS ADSORBED ON OXYGENATED TUNGSTEN. T. E. Phipps, E. G. Rauh, and O. C. Simpson. Aug. 27, 1951. Decl. Jan. 6, 1956. 38p. Contract W-31-109-eng-38. $6.30(ph OTS); $3.00(mf OTS)

Attempts were made to ionize Pu on the surface of a tungsten filament exposed to an atomic beam of Pu atoms. No evidence of surface ionization was found under several experimental conditions, from which fact it was concluded that the ionization potential is greater than 6.2 volts. Electron emission from the filament was followed as Pu atoms were deposited on the surface at a constant rate. A log i. log t plot exhibited the same characteristics as similar plots for the adsorption of other metal atoms: a linear portion, a maximum, and a decrease toward a constant value. Adsorbed oxygen atoms were shown to increase the slope of the linear portion from about 4 for small oxygen coverage to 8.5 for complete oxygen coverage. By following the evaporation of the adsorbed Pu atoms thermionically the heat of evaporation of Pu from tungsten was determined to be 140 to 145 kcal $mole^{-1}$ at low concentrations of adsorbed Pu atoms and was shown to decrease with increasing concentration. The evidence indicates that Pu is adsorbed as ions among adatoms of oxygen in a mixed film rather than as a second layer on top of the adsorbed oxygen atoms. It is concluded that there are no known experimental conditions under which Pu may be ionized by the method of surface ionization. (A.G.)

3500   CK-942

California. Univ., Berkeley. Radiation Lab. THE DISTRIBUTION OF PLUTONIUM TRACER BETWEEN METALS AND THEIR MOLTEN HALIDES. I. THE URANIUM – URANIUM BROMIDE SYSTEM. R. A. Webster. II. THE LEAD – LEAD CHLORIDE SYSTEM. B. J. Fontana. [194?]. Decl. Dec. 13, 1955. 12p. $3.30(ph OTS); $2.40(mf OTS).

Studies were initiated on the high-temperature oxidation-reduction relations of Pu in $U-UBr_3$ and $Pb-PbCl_2$ systems. Plutonium appears to be more electropositive than U or Pb. (C.W.H.)

3501 CK-1359

California. Univ., Berkeley. Radiation Lab.
THE DISTRIBUTION OF PLUTONIUM TRACER BETWEEN
METALS AND THEIR MOLTEN HALIDES. III. FURTHER
EXPERIMENTS IN THE URANIUM – URANIUM BROMIDE
SYSTEM INCLUDING EXPERIMENTS WITH THORIUM
TRACER. IV. THE MANGANESE – MANGANOUS CHLO-
RIDE SYSTEM. V. THE CALCIUM – CALCIUM CHLO-
RIDE SYSTEM. R. A. Webster. Feb. 1, 1944. Decl. Dec.
12, 1955. 17p. Contract [W-7405-eng-48]. (A-2004).
$3.30(ph OTS); $2.40(mf OTS).

Additional studies on the electrochemical properties of
Pu in $U-UBr_3$, $Mn-MnCl_2$, and $Ca-CaCl_2$ systems
indicate that Pu is more electropositive than U and Mn
and less electropositive than Ca. (See also CK-942).
(C.W.H.)

3502 CK-1529

Chicago. Univ. Metallurgical Lab.
THE DISTRIBUTION OF PLUTONIUM TRACER BETWEEN
METALS AND THEIR MOLTEN HALIDES. VI. DISTRI-
BUTION OF PLUTONIUM AND URANIUM TRACERS IN
THE MAGNESIUM METAL-HALIDE SYSTEM. B. J.
Fontana. Feb. 21, 1944. Decl. Dec. 13, 1955. 15p.
(A-2207). $3.30(ph OTS); $2.40(mf OTS).

Additional studies on the electrochemical behavior of Pu
and U in $Mg-MgX_2$ (where X = halide) suggest that Pu is
more electropositive than U or Mg. (See also CK-942.)
(C.W.H.)

3503 CK-1712

[California. Univ., Berkeley. Radiation Lab.]
THE DISTRIBUTION OF PLUTONIUM TRACER BETWEEN
METALS AND THEIR MOLTEN HALIDES. VII. DISTRI-
BUTION OF PLUTONIUM TRACER IN THE STRONTIUM—
STRONTIUM BROMIDE AND THE BARIUM—BARIUM
BROMIDE SYSTEMS. B. J. Fontana. May 16, 1944. Decl.
Dec. 15, 1955. 11p. (A-2437). $3.30(ph OTS); $2.40
(mf OTS).

Investigations on the high-temperature oxidation—
reduction relations of Pu in $Sr-SrBr_2$ and $Ba-BaBr_2$
systems indicate that Sr and Ba are more electropositive
than Pu. (See also CK-942.) (C.W.H.)

3504 CN-1702

[Chicago. Univ.] Metallurgical Lab.
CHEMICAL RESEARCH—BASIC CHEMISTRY OF PLUTO-
NIUM REPORT FOR MONTH ENDING JUNE 1, 1944.
June 26, 1946. Decl. Dec. 13, 1955. 35p. (A-2431)
$6.30(ph OTS); $3.00(mf OTS).

Progress is reported in the following studies: measure-
ments of oxidation potentials of $Pu(III)-Pu(IV)$ couples;
measurements of the solubilities of Pu(III) and Pu(IV)
phosphates and Pu(III) and Pu(IV) oxalates in HCl or HNO_3
at various temperatures; the co-separation of Pu with
various carriers; the crystal structure of Pu(IV) phosphate
and oxalate; the ether extraction of Pu; the hydrolysis of
Pu(III) and Pu(IV); the precipitation of $Pu(OH)_4$ from
nitrate and from sulfate solution; the rate of oxidation of
Pu(IV) by HNO_2 in various concentrations of H_2SO_4; the
rate of reduction of Pu(IV) by SO_2; the rate of oxidation of
Pu(IV) by ceric nitrate and by dichromate in nitric acid;
variations in the optical density of the Pu(III) absorption
bands with concentration of Pu; basic chemical studies on
the $BiPO_4$ extraction of Pu; and the purification of Pu
following recovery from a large variety of materials.
(C.H.)

3505 LA-112

Los Alamos Scientific Lab., N. Mex.
THE PREPARATION OF PLUTONIUM TRICHLORIDE.
C. S. Garner, S. E. Bakes, I. B. Johns, G. H. Moulton,
and B. Weinstock. July 24, 1944. Decl. Dec. 13, 1955.
14p. Contract [W-7405-eng-36]. $3.30(ph OTS);
$2.40(mf OTS).

The preparation of $PuCl_3$ by the chlorination of PuO_2
in the presence of CCl_4 vapor and by other methods are
described. Several physical properties of $PuCl_3$ are re-
ported. (C.W.H.)

3506 LA-172

[Los Alamos Scientific Lab., N. Mex.]
DECOMPOSITION PRODUCTS OF PLUTONYL NITRATE
AND PLUTONIUM OXALATE. G. H. Moulton. Nov. 14,
1944. Decl. Dec. 13, 1955. 10p. Contract [W-7405-
eng-36]. $1.80(ph OTS); $1.80(mf OTS).

Results show that both of these compounds decompose
directly to the dioxide with no evidence of formation of any
intermediate compounds. (auth)

3507 LA-381

Los Alamos Scientific Lab., N. Mex.
EQUILIBRIUM CONSTANTS AND HEATS OF REACTION
FOR THE HYDROFLUORINATION OF URANIUM DIOXIDE
AND PLUTONIUM DIOXIDE. I. B. Johns. Aug. 30, 1945.
Decl. Dec. 10, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

Direct determinations were made of the equilibrium
conditions for the reactions of HF with UO_2 at 600°C,
705°C and 800°C and with PuO_2 at 400°C and 600°C. From
these data, the equilibrium constants at these temperatures
were calculated. From the change of equilibrium constant
with temperature, the heats of reaction were calculated.
The heat of reaction of HF on UO_2 to yield UF_4 was found
to be $-\Delta H = 42080$ cal/mol. This is in fair agreement
with the value 45800 cal/mol calculated from the known
heats of formation of the compounds involved in the reac-
tion. The heat of reaction of HF on PuO_2 calculated from
the equilibrium constants at 400° and 600°C is 10220
cal/mol. (auth)

URANIUM AND URANIUM COMPOUNDS

3508 A-28

Iowa State Coll., Ames.
ORGANO URANIUM COMPOUNDS. I. [Report for Period
January 21, 1941 to May 20, 1941]. Henry Gilman. Decl.
Dec. 6, 1955. 8p. $1.80(ph OTS); $1.80(mf OTS).

Attempts to prepare compounds containing $C-U$ linkages
by direct reaction of U metal and of a $U-Ni$ alloy with
methyl iodide were unsuccessful. The displacement of Hg
or Pb from the ethyl compounds of these metals by U did
not take place under the conditions tried. Reactions of
uranous chloride and of uranyl chloride with various
organometallic compounds in several solvents resulted
either in reduction of the salts with the formation of
hydrocarbons or in no change. These results are quite
comparable to those obtained with other transition elements
and particularly reactions with Ti salts. The reaction of
UCl_3 with methylmagnesium iodide resulted in very little
gas formation. This may have been due to traces of mois-
ture or of uranous chloride. The reactions of this salt
(UCl_3) with other organometallic compounds in inert
solvents (like benzene or petroleum ether) appear worthy of

further study. Reactions of uranium chlorides with less reactive organometallic compounds in alcoholic solutions result in secondary products due to solvolysis of the metal salts. This may also be true of long time reactions in ether. (auth)

3509   A-30
Iowa State Coll., Ames.
ORGANO URANIUM COMPOUNDS. III. [Report for Period] June 16, 1941 to August 9, 1941. Henry Gilman. Decl. Dec. 6, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

Attempts are reported to prepare compounds containing $C-U$ linkages. Reactions between p-tolyl diazonium chloride and U tetrachloride and between p-tolyl diazonium chloride and uranyl chloride yielded materials which contained both U and C. Other reactions reported were unsuccessful. (C.H.)

3510   A-523
Ames Lab., Ames, Iowa.
DIRECTIONS FOR THE PREPARATION OF $X(OC_2H_5)_5$ [AND] $X(OC_2H_5)_6$. Henry Gilman. Feb. 6, 1943. Decl. Dec. 8, 1955. 15p. OSRD Project No. 346. (100XR-150). $3.30(ph OTS); $2.40(mf OTS).

Uranium pentaethoxide, $U(OC_2H_5)_5$, may be prepared by the reaction of UCL_4 with sodium ethoxide followed by direct oxidation of the ethyl-alcohol solution of the intermediate product. Yields ($\sim$ 65%) were obtained. (C.W.H.)

3511   A-728
Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.
THE REACTION OF TUBEALLOY TETRAFLUORIDE WITH ANTIMONY PENTAFLUORIDE. Progress Report [covering period] October 15, 1942 to October 28, 1942. A. L. Linch. May 17, 1943. Decl. Dec. 8, 1955. 3p. (100XR-1216). $1.80(ph OTS); $1.80(mf OTS).

An attempt was made to synthesize UF_6 by fluoride exchange between SbF_5 and UF_4. Antimony pentafluoride with UF_4 formed an equimolecular complex thermally stable to 200°C, decomposed by water to UF_4, and soluble in antimony salts. Heating to 650°C did not produce noticable quantities of volatile U salts, but gave 15 to 20% yield of water soluble U derivatives in the residue. (C.H.)

3512   A-1008
Harshaw Chemical Co., Cleveland.
TENTATIVE METHODS FOR ANALYZING WE-22 (UF_4). July 28, 1953. Decl. Dec. 8, 1955. 6p. $1.80(ph OTS); $1.80(mf OTS).

Procedures are described for the gravimetric determination of U and the volumetric determinations of UO_2F_2, UF_4, and Fe in UF_4 samples. (C.W.H.)

3513   A-1025
Mallinckrodt Chemical Works, St. Louis.
CONCENTRATION OF UX_1 [Th^{234}] FROM UO_2. H. Yeager and J. A. Kyger. Feb. 2, 1944. Decl. Dec. 2, 1955. 3p. Contract [W-14-108-eng-8]. $1.80(ph OTS); $1.80(mf OTS).

Thorium^{234} was concentrated from nitrate solutions of UO_2 by repeated ether$-H_2O$ extractions. The Th^{234} was then precipitated by addition of excess NaOH. A concentration factor of $\sim 10^9$ was obtained. (C.W.H.)

3514   A-1058
Du Pont de Nemours (E. I.) and Co. Jackson Lab. [Wilmington, Del.]
PRELIMINARY PLANT PROCESS FOR THE MANU-

FACTURE OF SODIUM URANATE FROM URANIUM HEXA-FLUORIDE CONTAINING Ø-DIMETHYLCYCLOHEXANE (C_8F_{16}). D. X. Klein. Sept. 16, 1944. Decl. Dec. 8, 1955. 12p. $1.80(ph OTS); $1.80(mf OTS).

Uranium hexafluoride containing up to 40% Ø-dimethyl-cyclohexane is vaporized from its container into an aqueous caustic solution in a closed system. The resulting solution, at a pH of 7.0 to 7.5 is steam-distilled to recover the fluorocarbon. Sodium hydroxide solution is added to the hot solution to precipitate sodium uranate at a pH of 10.0 to 10.5. The soda salt is filtered, washed practically free of sodium fluoride and dried. (auth)

3515   A-1083
Mallinckrodt Chemical Works, St. Louis.
A SHORTER ASSAY METHOD FOR URANIUM MATERIALS AND SOME INTERFERENCES IN THE TITRATION. T. R. Barddock, C. L. French, G. L. Martin, and J. R. McCoy. May 14, 1945. Decl. Dec. 5, 1955. 11p. $1.80(ph OTS); $1.80(mf OTS).

A volumetric determination of U is described which makes use of cupron for the precipitation of molybdenum, followed by extraction with chloroform, and the usual cupferron separation. Interfering ions (NO_3^-, V^{5+}, U^{4+}, and Mo) are removed by this method. (C.W.H.)

3516   Å-1277
Columbia Univ., New York. Div. of War Research.
THE THERMAL STABILITY OF URANIUM OXIDES AND URANIUM OXIDE HYDRATES IN WATER. D. Vier. May 26, 1944. Decl. Dec. 8, 1955. 55p. Contract W-7405-eng-50. (100K-R-654). $9.30(ph OTS); $3.60(mf OTS).

Data are presented from an investigation of the thermal stability of U oxide slurries. Most of the data presented deal with U trioxide hydrates. (C.H.)

3517   A-2702
Purdue Univ., LaFayette, Ind.
DETERMINATION OF TUBALLOY [URANIUM] WITH THE X-RAY SPECTROGRAPH. Summary Report. Oct. 25, 1945. Decl. Dec. 14, 1955. 9p. Contract W-7405-eng-74. $1.80(ph OTS); $1.80(mf OTS).

The applicability of the x-ray spectrograph to the problem of detecting small amounts of U in the presence of large amounts of other elements such as Cu, Fe, Cr, and Mn has been studied. The effects produced by the variation of several experimental conditions on the sensitivity of the instrument to the U L_{α_1} line have been investigated. These experimental conditions include the potential applied on the x-ray tube, the time of exposure, the size of the angle of oscillation, the crystal used for the reflection grating, the type of film and the use of an intensifying screen in connection with the film. Using optimum conditions, namely 60 kv peak tube voltage, 10 ma. tube emission, sodium chloride crystal, Eastman No-Screen x-ray film and an exposure time of about 72 min per degree of oscillation, it was possible to detect the presence of one part of U in 2,000 parts of Fe by weight in a mixture of the oxides. (auth)

3518   A-2709
Purdue Univ., Lafayette, Ind.
TITRIMETRIC DETERMINATION OF URANIUM WITH POTASSIUM DICHROMATE. M. M. Kruder, W. S. Barnhart, H. Hunt, E. S. Gantz, and M. G. Mellon. Mar. 8, 1946. Decl. Dec. 8, 1955. 6p. Contract W-7405-eng-74. $1.80(ph OTS); $1.80(mf OTS).

A rapid titrimetric procedure is described for the

determination of U in presence of moderate amounts of Cr, Cu, Ni, Cl, and Fe. After correcting for Fe, a precision of about 1 part in 1000 was obtained under routine conditions. (auth)

3519   A-3387

[Wisconsin Alumni Research Foundation].

FURTHER EXPERIMENTS ON THE PREPARATION OF UF_6. William Krasny Ergen. July 29, 1942. Decl. Dec. 13, 1955. 4p. (100RD-152). $1.80(ph OTS); $1.80(mf OTS).

The attempted preparations of UF_6 by the reactions of UF_4 with HgF and Cl_2 or with HgF_2 as fluorinating agent are described. Uranium(VI) fluoride was obtained in small yield. (auth)

3520   A-3505

Du Pont De Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

METHODS OF CONTROLLING BULK DENSITY OF C-108 [UO_3] PRODUCED FROM NON-ETHER-EXTRACTED C-106. [$UO_2(NO_3)_2 \cdot 6H_2O$] C. W. Maynard, Jr. Dec. 3, 1945. Decl. Dec. 8, 1955. 6p. Contract W-7412-eng-151. $1.80(ph OTS); $1.80(mf OTS).

The bulk density of UO_3 produced from non-ether extracted $UO_2(NO_3)$ was lower than that produced from ether-extracted nitrate. The sulfate impurities appeared to affect the bulk density of the UO_3 produced. (C.W.H.)

3521   A-3506

Du Pont de Nemours (E. I.) and Co. Jackson Lab., [Wilmington, Del.],

RAPID ANALYSIS FOR SMALL AMOUNTS OF URANIUM IN GYP CAKES. Problem Report [for] Period November 2, 1944−December 3, 1945. Alvan Donnan. Dec. 12, 1945. Decl. Dec. 7, 1955. 17p. Contract W-7412-eng-151. (JWD-69). $3.30(ph OTS); $2.40(mf OTS).

A colorimetric method for the determination of U in "gyp" is described. The method consists of acid digestion, Na_2CO_3 digestion, filtration, H_2O_2 addition, and color measurement. (C.W.H.)

3522   A-3507

Du Pont de Nemours (E. I.) and Co. Jackson Lab., [Wilmington, Del.]

MINIMIZING THE URANIUM CONTENT OF GYP CAKES. Problem Report [for] Period March 9, 1945 to September 25, 1945. Alvan Donnan. Dec. 17, 1945. Decl. Dec. 8, 1955. 8p. Contract W-7412-eng-151. (JWD-70). $1.80 (ph OTS); $1.80(mf OTS).

The uranium content of gyp cakes can be decreased by substituting Na_2CO_3 for $CaCO_3$ during lime out and by extracting off-quality gyp with aqueous Na_2CO_3. (auth)

3523   A-3550

Du Pont de Nemours (E. I.) & Co. Wilmington, Del.

CHAMBERS WORKS PROCESS FOR THE MANUFACTURE OF SODIUM URANATE FROM N. G. SOLUTIONS OF URANYL NITRATE HEXAHYDRATE. J. A. Alexander. Jan. 24, 1945. Decl. Dec. 2, 1955. 4p. Contract W-7412-eng-3. $1.80(ph OTS); $1.80(mf OTS).

Sodium uranate is produced by adding excess soda caustic solution to N.G. solutions of uranyl nitrate. The solution is then filtered and the press cake is put into barrels. (C.W.H.)

3524   A-3554

Du Pont de Nemours (E.I.) & Co. Engineering Dept., Wilmington, Del.

CHAMBERS WORKS PROCESS FOR THE MANUFACTURE OF SODIUM URANATE FROM SUMP DRAININGS. (M. W. 348.06). James A. Alexander. Jan. 29, 1945. Decl. Dec. 2, 1955. 3p. Contract W-7412-Eng-3. $1.80(ph OTS); $1.80(mf OTS).

Sodium uranate may be precipitated by adding NaOH in excess to the sump drainings (uranyl nitrate solutions). (C.W.H.)

3525   A-4024

Kellex Corp., New York.

SOME REACTIONS OF URANYL ION IN ALKALINE SOLUTION. (Research Paper No. E-12A). Robert H. Lafferty, Jr., S. C. Schuman, K. J. Radimer, and S. H. Smiley. Apr. 12, 1946. Decl. Dec. 2, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

The absorption of UF_6 in alkaline media was studied. In relation to the design of a suitable tower for absorption of the former, sodium bicarbonate was found to be the best alkaline reagent for the absorption in aqueous solution, ethanolamine the best non-aqueous reagent. The chemistry of each absorption has been examined insofar as it has related to design of an absorption tower for gaseous mixtures of F_2, UF_6, and N_2. The formation of soluble U compounds formed when UF_6 and F_2 are discharged into a NaOH solution is discussed. (auth)

3526   AECD-3851

Massachusetts Inst. of Tech., Cambridge.

URANIUM−ZIRCONIUM EXPLOSIONS IN NITRIC ACID. R. B. Russell. May 11, 1953. 5p. Decl. Dec. 5, 1955. Contract [W-7405-eng-175]. (MIT-RBR-4). $1.80(ph OTS); $1.80(mf OTS).

An investigation of explosions between a U−Zr alloy (80 wt. % U) and HNO_3 indicates that the explosion is a result of surface shock. The mechanism of the explosion is unknown. (C.W.H.)

3527   AECD-3854

Tennessee Eastman Corp., Oak Ridge, Tenn.

VAPOR PHASE CHLORINATION OF TO$_3$ [UO_3]. Progress Report. George S. Parsons, Charles L. McCabe, G. F. Engle, and C. E. Larson. Apr. 2, 1945. Decl. Jan. 4, 1956. 14p. Project 31. Contract W-7401-eng-23. (CD-564-CEL-A). $3.30(ph OTS); $2.40(mf OTS).

Progress is reported in a study of various laboratory methods for the gas phase chlorination of UO_3. The use of vertical tube chlorinators with a bore up to 3 in. with CCl_4 as a chlorinating agent at temperatures not exceeding 500°C was shown to be possible. The high temperature chlorination of UO_3 and C by Cl, and the chlorination of UO_3 by CCl_4 at high temperatures appeared to be a practical method for the preparation of UCl_4. Thionyl chloride used as a chlorinating agent at temperatures not exceeding 300°C was shown to be a very efficient chlorinating agent. (C.H.)

3528   AECD-3867

Brown Univ., Providence.

PROGRESS REPORT [ON] CONTRACT OEMsr-290. SUPPLEMENT 2. Charles A. Kraus. Oct. 8, 1942. Decl. Dec. 12, 1955. 8p. (BT-8). $1.80(ph OTS); $1.80(mf OTS).

The solubility of uranyl nitrate in ethyl acetate was redetermined. Distribution coefficients of $UO_2(NO_3)_2$ in several solvent pairs are given. The thermal decomposition of uranium peroxide was investigated. Gravimetric, volumetric, and conductance methods for the analysis of $UO_2(NO_3)_2$ solutions were compared. (C.W.H.)

3529   AECD-3875
Tennessee Eastman Corp., Oak Ridge, Tenn.
TUBALLOY TETRACHLORIDE [UCl$_4$]. E. L. Wagner.
Feb. 6, 1946. Decl. Dec. 2, 1955. 1p. [Contract W-
7401-eng-23]. (C-2.381.4). $1.80(ph OTS); $1.80(mf
OTS).

The properties, preparation, and chemical reactions of
UCl$_4$ are graphically presented. (C.W.H.)

3530   AECD-3897
Tennessee Eastman Corp., Oak Ridge, Tenn.
A SPECTROPHOTOMETRIC DETERMINATION OF MIX-
TURES OF HEXAVALENT AND TETRAVALENT [URANI-
UM]. L. J. Andrews, Ward B. Schaap, and J. W. Gates, Jr.
Preliminary Report. Feb. 17, 1945. Decl. Dec. 15, 1955.
6p. Contract W-7401-eng-23. (CD-4003). $1.80(ph OTS);
$1.80(mf OTS).

A spectrophotometric method for the analysis of
solutions, containing U^{4+} and U^{6+}, has been developed.
Optical densities of the solution are measured at 630 and
410 mμ from which the respective concentrations of U^{4+}
and U^{6+} can be determined. The method is accurate to
within 3%. (C.W.H.)

3531   AECD-3908
Tennessee Eastman Corp., Oak Ridge, Tenn.
A DETERMINATION OF THE U-235 CONTENT IN HIGHLY
IMPOVERISHED MATERIAL. A. E. Cameron and
Roger F. Hibbs. May 9, 1946. Decl. Dec. 12, 1955.
6p. (B-6.460.14). $1.80(ph OTS); $1.80(mf OTS).

Mass spectrometric analyses of highly impoverished
material for residual U^{235} content are reported. A value
of 25,000 for the ratio U^{238}/U^{235} was obtained. (C.W.H.)

3532   AECD-3910
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
APPLICATION OF ASCORBIC ACID METHOD TO URANI-
UM IN SALVAGE SOLUTIONS. C. D. Rothenberger and W.
R. Grimes. June 11, 1947. Decl. Dec. 7, 1955. 23p.
[Contract W-7405-eng-26]. (H-4.360.14). $4.80(ph OTS);
$2.70(mf OTS).

The ether extraction—ascorbic acid procedure for the
determination of U content in plant salvage solutions is
described. Pre-treatment of the solution with HClO$_4$ or
activated carbon is necessary to remove interfering trace
organic material. (C.W.H.)

3533   AECD-3911
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
TENTATIVE PROCEDURES FOR ANALYSIS OF HCP
PROCESS MATERIALS. H. J. Belknap, G. J. Nessle, and
W. R. Grimes. May 28, 1947. Decl. Dec. 8, 1955. 49p.
(H-4.360.12). $7.80(ph OTS); $3.30(mf OTS).

Procedures are presented for the potentiometric,
spectrophotometric, and fluorimetric determinations of U
in process materials; also, procedures are presented for
the determination of Cl$^-$, Cu, and Fe in process solutions.
Analyses of UO$_2$(NO$_3$)$_2$, UCl$_4$, machine wash solution, rinse
solution, reactor condensates, organic wastes, extracted
gunk, and carbon bowl residue are outlined. (C.W.H.)

3534   AECD-3917
Tennessee Eastman Corp., Oak Ridge, Tenn.
PREPARATION AND STABILITY OF COBALT TRIFLUO-
RIDE. J. Whitney, F. Smith, and A. J. Miller. Oct. 15,

1945. Decl. Dec. 21, 1955. 4p. Contract W-7401-eng-23.
(C-2.355.1). $1.80(ph OTS); $1.80(mf OTS).

Cobalt trifluoride CoF$_3$ was prepared by heating an-
hydrous CoCl$_2$ with F$_2$ at 300 to 400°C. It remains stable
when kept in sealed glass tubes but absorbs H$_2$O on
exposure to air. (auth)

3535   AECD-3932
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE USE OF SODIUM DIETHYL DITHIOCARBAMATE AS
A REAGENT FOR THE DETERMINATION OF T [U]. A.
G. Jones. Apr. 1942. Decl. Dec. 22, 1955. 10p. Con-
tract [W-7401-eng-23]. (C-4.360.9).

A rapid colorimetric method is presented for the deter-
mination of U in plant solutions. The absorbance of the
uranium diethyl dithiocarbamate in CCl$_4$ is measured at
380μ. (C.W.H.)

3536   AECD-3935
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE DETERMINATION OF SMALL AMOUNTS OF
THORIUM IN SOME URANIUM MATERIALS. E. W.
Christopherson, R. W. Woodard, and C. E. Larson. Sept.
11, 1946. Decl. Dec. 21, 1955. 13p. Contract W-7401-
eng-23. (C-0.380.8). $3.30(ph OTS); $2.40(mf OTS).

A method for the determination of small quantities of Th
in the presence of large quantities of U is presented. Solid
samples are dissolved in an appropriate acid. Reducible
metals are removed by means of a Hg cathode. Excess acid
is removed by fuming to dryness. The residue is dissolved
in water and made alkaline with saturated (NH$_4$)$_2$CO$_3$
solution, thus complexing the U and permitting the precipi-
tation of Th(OH)$_4$ with the aid of an Al(OH)$_3$ carrier.
Thorium is determined colorimetrically with thoron. (auth)

3537   AECD-3937
Tennessee Eastman Corp., Oak Ridge, Tenn.
DIRECT CONVERSION OF TF$_6$ [UF$_6$] TO TCl$_4$ [UCl$_4$].
Vincent P. Calkins. Sept. 25, 1945. Decl. Dec. 21, 1955.
6p. Contract W-7401-eng-23. (C-0.350.4). $1.80(ph
OTS); $1.80(mf OTS).

Results indicate that the conversion of UF$_6$ to UCl$_4$ pro-
ceeds through a two-step process involving UF$_4$. Uranium
(IV) chloride can be prepared by the direct reaction of UF$_4$
with AlCl$_3$ or BCl$_3$. (C.W.H.)

3538   AECD-3945
Tennessee Eastman Corp., Oak Ridge, Tenn.
QUANTITATIVE RECOVERY OF TUBALLOY FROM
TUBALLOY TETRAFLUORIDE. J. W. Gates, Jr., L. J.
Andrews, and W. B. Schaap. Feb. 22, 1945. Decl. Dec.
22, 1955. 4p. Contract W-7401-eng-23. (CD-4005).
$1.80(ph OTS); $1.80(mf OTS).

Uranium(IV) fluoride can be quantitatively converted to
ammonium uranate by the following procedures: reaction
of UF$_4$ with NH$_4$OH, then H$_2$O$_2$, acidification with HNO$_3$, and
precipitation with NH$_4$OH; reaction of UF$_4$ with H$_2$SO$_4$, then
(NH$_4$)$_2$S$_2$O$_8$, and precipitation with NH$_4$OH. Recoveries
($\sim$ 99%) of U were obtained. (C.W.H.)

3539   AECD-3947
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE PREPARATION OF TUBALLOY TETRACHLORIDE
BY FLUIDIZATION. J. V. Hubbard, H. A. Perlmutter,
H. L. Goren, and G. H. Clewett. Aug. 28, 1945. Decl.
Dec. 21, 1955. 10p. Contract W-7401-eng-23. (C-5.350.3).
$3.30(ph OTS); $2.40(mf OTS).

Preliminary investigation of the application of fluidization to UF$_4$ production indicated this was a very promising method of contacting a chlorinating gas with UO$_3$. A procedure was developed wherein reaction time with unactivated Mallinckrodt oxide was only twenty minutes at 240 to 280°C, and the product was of high quality and uniform texture. Both CCl$_4$ and thionyl chloride vapors were employed. With CCl$_4$ an average yield of 94% was obtained from the somewhat crude apparatus. (auth)

3540 AECD-3952

Tennessee Eastman Corp., Oak Ridge, Tenn.

THE CHLORINATION OF TO$_3$ [UO$_3$]. G. Gavlin and G. H. Clewett. Dec. 28, 1945. 12p. Decl. Dec. 19, 1955. Contract W-7401-eng-23. (C-5.350.5). $3.30(ph OTS); $2.40(mf OTS).

The applicability of specific mixtures and organic chlorocarbons in general toward the chlorination of UO$_3$ has been tested by means of reactions in sealed glass tubes. The results show that thionyl chloride mixed with tetrachloroethylene or a bromomethane of the type CHBrCl$_2$ will produce UCl$_4$ directly. This same result is produced by CBrCl$_3$ or CBr$_2$Cl$_2$ alone. (auth)

3541 AECD-3953

Tennessee Eastman Corp., Oak Ridge, Tenn.

SUMMARY OF INTERFERENCES IN THE FLUORESCENT DETERMINATION OF T. C. F. Coleman and A. A. Smales. [July 1945]. Decl. Dec. 19, 1955. 6p. Contract W-7401-eng-23. (C-4.360.2). $1.80(ph OTS); $1.80(mf OTS).

A study was made on the effects of the presence of 26 other ions on the fluorescence of a given amount of U. The fluorescent method used for the determination of U is described. Data are tabulated on the empirical quenching properties of the ions when 1 μg of U is present in the sample. (C.H.)

3542 AECD-3954

Tennessee Eastman Corp., Oak Ridge, Tenn.

THE AMMONIA REDUCTION AND ITS APPLICATION TO THE PREPARATION OF GREEN SALT. Dec. 29, 1945. 11p. Decl. Dec. 19, 1955. Contract W-7401-eng-23. (C-2.355.2). $3.30(ph OTS); $2.40(mf OTS).

Ammonia reacts readily with TO$_3$[UO$_3$] and T$_3$O$_8$[U$_3$O$_8$] at temperatures of 450° and above with the formation of TO$_2$[UO$_2$]. The reaction is applicable to the preparation of TO$_2$[UO$_2$] where it is desired as either a reaction intermediate or as final product. The ammonia reduction is directly applicable to the preparation of TF$_4$[UF$_4$]. When NH$_3$ and HF as gases or from distillation of NH$_4$F or NH$_4$HF$_2$ are simultaneously passed over TO$_3$[UO$_3$] at 500° or above, a simultaneous reduction and hydrofluorination produces TF$_4$. This reaction goes to completion, whereas the analogous reaction with H$_2$ and HF introduced simultaneously produces TF$_4$[UF$_4$] only in partial yields. The NF$_3$HF method for preparation of TF$_4$[UF$_4$] can apparently be carried out very rapidly. It gives products of adequate density, and has so far been employed on batches of up to 60 g in half-inch depth with satisfactory results. (auth)

3543 AECD-3955

Tennessee Eastman Corp., Oak Ridge, Tenn.

THE DIBUTYL CARBITOL–TUBANYL [URANYL] NITRATE ETHERATE. H. R. Grady, G. M. Armstrong, and J. W. Gates, Jr. Sept. 5, 1945. Decl. Dec. 19, 1955. 5p. Contract W-7401-eng-23. (C-1.365.5). $1.80(ph OTS); $1.80(mf OTS).

Uranyl nitrate etherate is formed during the solvent extraction of aqueous uranyl nitrate solutions with dibutyl carbitol. Molecular constitution, physical properties, and chemical properties of the etherate are discussed. (C.W.H.)

3544 AECD-3959

Tennessee Eastman Corp., Oak Ridge, Tenn.

TUBALLOY PEROXIDE [UO$_4$]. PART II. THE INFLUENCE OF SULPHATE ON THE SOLUBILITY AND RATE OF PRECIPITATION OF TUBALLOY PEROXIDE [UO$_4$]. P. F. Grieger, E. W. Christopherson, Roy Oringer, and J. W. Gates, Jr. April 19, 1945. Decl. Dec. 22, 1955. 32p. Contract W-7401-eng-23. (CD-4016). $6.30 (ph OTS); $3.00(mf OTS).

The solubility of UO$_4$ has been determined over a fairly wide range of SO$_4^{2-}$, H$^+$ and H$_2$O$_2$ concentrations. Sulfate decreases the rate of precipitation of UO$_4$. The equilibrium solubility of UO$_4$ varies inversely with H$_2$O$_2$ concentration. The solubility increases with the first power of SO$_4^{2-}$ at low concentrations but in the neighborhood of 1.0$\underline{M}$ SO$_4^{2-}$ the solubility is roughly proportional to the square of sulfate concentration. The solubility increases with a power of hydrogen ion slightly greater than one. The regions of quantitative precipitation have been plotted. (auth)

3545 AECD-3960

Tennessee Eastman Corp., Oak Ridge, Tenn.

TO$_3$ [UO$_3$] REDUCTION AND CHLORINATION IN THE EXPERIMENTAL GLASS FLUIDIZER. R. S. Lowrie and J. V. Hubbard. Dec. 20, 1945. Decl. Dec. 20, 1955. 10p. Contract W-7401-eng-23. (C-5.350.6). $3.30(ph OTS); $2.40(mf OTS).

Uranium(VI) oxide was reduced to UO$_2$ by reaction with NH$_3$ at temperatures above 400°C. The CCl$_4$ chlorination which was carried out in the temperature range, 350 to 400°C gave $\approx$99% conversion. (C.W.H.)

3546 AECD-3965

Tennessee Eastman Corp., Oak Ridge, Tenn.

THE REACTION OF HEXACHLOROPROPYLENE WITH METALLIC OXIDES. B. M. Pitt, E. L. Wagner, and A. J. Miller. Jan. 14, 1946. Decl. Dec. 21, 1955. 6p. Contract W-7401-eng-23. (C-2.355.3). $1.80(ph OTS); $1.80(mf OTS).

The action of refluxing hexachloropropylene was determined on 22 metallic oxides. It was found that anhydrous chlorides can be prepared with exceptional ease from the higher valent oxides of the V and VI group elements. (auth)

3547 ANL-4181

Argonne National Lab., Lemont, Ill.

PREPARATION OF UO$_3$. Irving Sheft and Sherman Fried. July 13, 1948. Decl. Dec. 14, 1955. 8p. Contract W-31-109-eng-38. $1.80(ph OTS); $1.80(mf OTS).

The preparation of anhydrous UO$_3$ by the oxidation of U$_3$O$_8$ or amorphous UO$_3$ in an oxygen atmosphere under high pressures is described. (C.W.H.)

3548 CC-3302

Chicago. Univ. Metallurgical Lab.

RECOVERY OF D$_2$O AND UO$_2$F$_2$ BY DISTILLATION. R. Fischer and A. Wattenberg. Oct. 10, 1945. Decl. Dec. 22, 1955. 9p. Contract W-7401-eng-37. $1.80(ph OTS); $1.80(mf OTS).

The purification and separation by distillation of UO$_2$F$_2$ from D$_2$O is described. In the experiment which is discussed 2,129.6 lbs of UO$_2$F$_2$ were dissolved in 6,605 lbs of D$_2$O. The apparent losses were 2.3 lbs of UO$_2$F$_2$ and

64 lbs of D_2O. The average isotopic purity of the D_2O decreased during the distillation from 99.77% to 99.73%. The dissolved impurities were less than those present originally in the heavy water. (C.H.)

3549   CC-3336
Chicago. Univ. Metallurgical Lab.
THE DETERMINATION OF THORIUM IN THORIUM—URANIUM ALLOYS, USING CUPFERRON. A. C. Eckert and R. W. Bane. DETERMINATION OF THORIUM IN URANIUM—THORIUM ALLOYS USING ION EXCHANGE. R. W. Bane. Nov. 23, 1945. Decl. Dec. 20, 1955. 12p. Contract W-7401-eng-37. $3.30(ph OTS); $2.40(mf OTS).

Two methods are described for the determination of Th in Th—U alloys low in Th. One method involves a cupferron precipitation in the presence of carbonate, used as buffer and complexing agent. The precipitate is weighed as thorium oxide after ignition. The second method involves an ion exchange separation of Th from U. The Th is then precipitated, ignited, and weighed in the conventional manner. (C.H.)

3550   CF-51-2-102
Oak Ridge National Lab., Tenn.
THE RECOVERY OF URANIUM FROM NATURAL WATERS OF THE UNITED STATES. F. R. Bruce and D. E. Ferguson. Feb. 17, 1951. Decl. Dec. 19, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

This report proposes that the natural waters of the United States be considered as an important potential source of U. It is believed that U can be economically recovered, by an anion exchange process, from fresh water containing as little as 10 parts of U per billion parts water. (auth)

3551   CF-51-11-44
Oak Ridge National Lab., Tenn.
SOME OBSERVATIONS ON UO_3 SLURRIES. Quarterly Report for Period August 10—November 10, 1951. J. O. Blomeke. Nov. 7, 1951. Decl. Dec. 19, 1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Progress is reported in the development of aqueous UO_3 slurries suitable for use at temperatures near 250°C and containing 100 to 300 g/l of U. Observation on the preparation of $\alpha UO_3 \cdot H_2O$, $\beta UO_3 \cdot H_2O$, $\gamma UO_3 \cdot H_2O$, and $\partial UO_3 \cdot H_2O$ slurries are summarized. (C.H.)

3552   CF-51-12-67
Oak Ridge National Lab., Tenn.
THE PREPARATION OF γ-$UO_3 \cdot H_2O$ FROM URANYL NITRATE. J. O. Blomeke and J. L. Bamberg. Dec. 12, 1951. Decl. Dec. 15, 1955. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The preparation of γ-$UO_3 \cdot H_2O$ crystals by precipitation of $UO_4 \cdot 2H_2O$, thermal decomposition of the peroxide in air to UO_3, and hydration of the trioxide was investigated. A flowsheet is presented for the production of 1-kg quantities of γ-$UO_3 \cdot H_2O$. (C.H.)

3553   CN-795
Ames Lab., Ames, Iowa.
CHEMICAL RESEARCH—CHEMISTRY OF 94 (PLUTONIUM). Report for Month Ending July 15, 1943. Decl. Dec. 13, 1955. 5p. Contract [W-7405-eng-82]. (A-988). $1.80(ph OTS); $1.80(mf OTS).

The metallurgical separation of Pu from U metal was studied. In the process, the U is alloyed with Sn, the Sn—U alloy converted to hydride, the hydride dissolved in acid,

and the Pu separated from this solution. Removal of 93% of the Pu from 90% of the U has been achieved. (C.W.H.)

3554   K-315
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
USE OF ZINC NITRATE IN DECONTAMINATION SOLUTIONS. R. G. Stirling, T. A. Kirkham, and T. Cantwell. Sept. 25, 1948. Decl. Dec. 5, 1955. 26p. For Carbide and Carbon Chemicals Corp. K-25 Plant. Contract [W-7405-eng-26], Subcontract 70. $4.80(ph OTS); $2.70(mf OTS).

Investigation into the use of zinc nitrate in decontamination solutions showed that the replacement of calcium nitrate by zinc nitrate had no appreciable effect on decontamination properties, and that distribution coefficients obtained were satisfactory. Results from extraction column operation were inconclusive. (auth)

3555   K-421
Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn.
STUDY OF THE SOLUBILITY OF URANYL AMMONIUM PHOSPHATE IN WATER AT 25°C. H. A. Bernhardt, J. H. Junkins, and S. S. Kirslis. June 15, 1949. Decl. Dec. 27, 1955. 6p. Contract [W-7405-eng-26]. (KLO-112). $1.80(ph OTS); $1.80(mf OTS).

The solubility of uranyl ammonium phosphate tetrahydrate in water was determined at 25°C. The solubility was found to be 0.2 μg/U/ml. (auth)

3556   K-482
Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn.
THE ELECTRICAL RESISTIVITY AND DIELECTRIC CONSTANT OF LIQUID URANIUM HEXAFLUORIDE. J. F. Burns, H. S. McKown, and I. Asbury. Aug. 10, 1949. Decl Dec. 27, 1955. 14p. Contract [W-7405-eng-26]. (KLO-138). $3.30(ph OTS); $2.40(mf OTS).

The value of the cofficient of electrical resistivity of liquid U hexafluoride has been found to be of the order of 10^{14} ohm c. This value is not appreciably altered by the presence of hydrogen fluoride in amounts normally encountered in plant operations. The dielectric constant of liquid U hexafluoride has been found to be 2.57 at 500, 1000 and 2000 cycles per sec. (auth)

3557   K-719
Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn.
X-RAY INSTRUMENT FOR MEASUREMENT OF URANIUM DEPOSITS IN PLANT EQUIPMENT. W. C. Taylor. Jan. 31, 1951. Decl. Dec. 27, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

An x-ray instrument for transmission measurements was adapted for plant use in measuring small deposits of U in closed containers. It was found that with careful monitoring of all affecting variables, a change of 0.1 g/cm_2 of solid uranium could be detected in a closed container 8 ft in diameter with 7/16 in. steel walls. The backscatter radiation method of measuring deposits in closed containers was also investigated but the required sensitivity was not attainable because of the thickness of the container walls which would be encountered. (auth)

3558   KLX-35
Kellex Corp., New York
REPORT OF SHARPLES CENTRIFUGE TESTS. Job. 11.

Feb. 15, 1949. Decl. Dec. 7, 1955. 11p. Contract AT-30-1-GEN-169. $1.80(ph OTS); $1.80(mf OTS).

Results are presented of tests of two commercial centrifuges for the separation of precipitated U soda-salts from a representative sodium diuranate slurry sample. (C.H.)

3559   KLX-37
Kellex Corp., New York.
STUDIES OF ALKALINE PRECIPITATION OF URANIUM. R. O. Hill and W. R. Peterson. Feb. 21, 1949. Decl. Dec. 7, 1955. 28p. Contract AT-30-1-Gen-169. $4.80 (ph OTS); $2.70(mf OTS).

Results of a program of experimental work on the precipitation of U from nitrate solutions by means of sodium hydroxide, are presented. A study was made of the effect of various anions on the precipitation reaction and the extent to which phosphate and sulfate ions may be removed from the precipitates by water washing. Probable reactions occurring during precipitation are proposed and pH curves illustrating the various titrations are presented. (auth)

3560   M-2142
Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.
CHAMBERS WORKS PROCESS FOR THE MANUFACTURE OF PERURANIC ACID (338.20). G. M. Richardson. Nov. 15, 1944. Decl. Dec. 5, 1955. 6p. Contract [W-7412-eng-2]. (BP-13). $1.80(ph OTS); $1.80(mf OTS).

Uranyl sulfate solution was clarified by filtration and precipitated as peruranic acid by means of hydrogen peroxide under controlled pH conditions. The precipitated peruranic acid was isolated in a filter press or centrifuge. The reaction is indicated by the equation : $UO_2SO_4 + H_2O_2 \rightarrow UO_4 \cdot 2H_2O + H_2SO_4$. The yield in this operation is about 99.0% of theory. About 1,911 lb of U were obtained per charge as a 45% paste of peruranic acid. (C.H.)

3561   MCW-103
Mallinckrodt Chemical Works, St. Louis.
TREATMENT OF URANIUM DIOXIDE WITH WATER VAPOR AT HIGH TEMPERATURES. C. W. Kuhlman. Aug. 13, 1948. Decl. Dec. 5, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

Uranium tetrafluoride prepared by the 1948 Mallinckrodt plant process consistently contains a larger water soluble fraction than can be attributed to a reaction of the hydrogen fluoride with the amount of hexavalent U present in the dioxide. In experimental equipment this tendency has been even more marked, both here and at other plants. A possible explanation is the reaction $U_3O_8 + 8\ HF \rightarrow 2\ UO_2F_2 + UF_4 + 4\ H_2O$. Evidence is presented to show that this increase in hexavalent U is not due to an oxidation reaction between UO_2 and water. That is, the reaction $3\ UO_2 + 2\ H_2O \rightarrow U_3O_8 + 2\ H_2$ does not take place under the conditions studied. (auth)

3562   MCW-136
Mallinckrodt Chemical Works, St. Louis.
AN INVESTIGATION OF THE SAMPLING PROCEDURES OF THE ORE ASSAY PROCEDURE. S. H. Houston and J. R. Simmler. Sept. 1948. Decl. Dec. 5, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

In contrast to regular sampling procedure, the entire sample was rolled 50 times and spread out as thin as possible. Small samples, from the surface of the ore to the paper, were taken at evenly distributed points throughout the ore until a 50-g amount was collected. The whole 50-g sample was digested and a suitable aliquot taken for analysis. No essential difference was noted from the results of assays sampled by the 50-g procedure and the regular MCW sampling procedure. (L.M.T.)

3563   MITG-244
Massachusetts Inst. of Tech., Cambridge. Mineral Engineering Lab.
A SEARCH FOR SELECTIVE SOLVENTS OF URANIUM NITRATE FROM OTHER NITRATES. William V. Ward. Jan. 17, 1951. Decl. Dec. 6, 1955. 37p. Contract AT-30-1-gen-211. $6.30(ph OTS); $3.00(mf OTS).

The extractive properties of several organic solvents for the nitrates of U and its common impurities have been studied, employing a liquid-solid extraction technique. The effects of dilute HNO_3 and CCl_4 on the solvent properties were investigated. Physical properties of the solvents tested are tabulated. (C.W.H.)

3564   NYO-5164
Mallinckrodt Chemical Works, St. Louis.
A COMPARISON OF THE NITRIC ACID CONSUMPTION AND INSOLUBLE VALUES REPORTED BY THE LABORATORY WITH THOSE OBTAINED IN PILOT PLANT OPERATION. Preliminary Report. S. H. Brown, A. J. Cook, E. I. Miller, D. Smith, A. Tomoufoik, and J. H. Yeager. Feb. 15, 1946. Decl. Dec. 2, 1955. 7p. Contract W-14-108-eng-8. $1.80(ph OTS); $1.80(mf OTS).

The present process for removing U from pitchblende involves the digesting of ore with HNO_3 to dissolve the uranium compounds present. The resultant slurry is filtered on a rotary drum type filter. To obtain a high yield, it is necessary to add enough HNO_3 to react with the oxides and other compounds present and have about a $1N$ excess of HNO_3 after the reaction has been completed. In order to have a resultant slurry which is capable of being filtered on a rotary drum filter, the amount of solids in the slurry should be at least 250 g/l. In addition, slurries are unfilterable if no excess HNO_3 is present. A test was devised in which a measured amount of HNO_3 was allowed to react with a small quantity of ore and the excess HNO_3 present after the reaction was titrated back with caustic to determine the quantity of acid consumed. The amount of 38° Baume HNO_3 consumed per gram of ore was called HNO_3 consumption and reported as such. A test was also devised in which a small amount of ore was tested with HNO_3, the resultant slurry filtered, and the dry cake weighed. The percentage of the ore found as dried cake was termed percent HNO_3 insoluble. A comparison is made of the values obtained by the laboratory with those obtained in pilot-plant operation. (J.E.D.)

3565   RL-4.6.231
California. Univ., Berkeley. Radiation Lab.
ABSORPTION SPECTRA OF TCl_4 [UCl_4] VAPOR. F. L. Reynolds and P. H. Davidson. Nov. 30, 1943. Decl. Dec. 7, 1955. 6p. Contract W-7405-eng-48. (Chem.-S-231). $1.80(ph OTS); $1.80(mf OTS).

The absorption spectrum of TCl_4 (UCl_4) vapor was determined between wave lengths of 5000 and 2200 A and at temperatures from 250 to 520°C in steps of 10° intervals for the principal purpose of ascertaining the proper wave length of light to use in a suggested method of measuring and controlling the vapor pressure of TCl_4 by optical instrumentation. (auth)

3566   UCRL-196
California. Univ., Berkeley. Radiation Lab.
SPECIES OF URANIUM(VI) WITH TTA IN BENZENE AND
PERCHLORIC ACID. THE CHARGE ON URANYL ION.
William C. Orr. Sept. 1948. Decl. Dec. 8, 1955. 82p.
Contract W-7405-eng-48. $12.30(ph OTS); $4.50(mf OTS).

The distribution coefficient of U^{6+} between dilute $HClO_4$
and benzene solutions of TTA was determined. The data
are interpreted to show that the principal species in the
acid phase is a doubly charged ion, UO_2^{++}. Two previously
unreported species of U^{6+} in the presence of TTA,
$UO_2K_2 \cdot HK$ in benzene and UO_2K^+ in dilute acid, were found.
The absorption spectra of all principal species are re-
ported. (auth)

3567   Y-63
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
8-HYDROXYQUINOLINE COLORIMETRIC METHOD FOR
THE DETERMINATION OF MICROGRAM QUANTITIES OF
URANIUM. D. A. Lee and R. W. Woodard. Nov. 19,
1947. Decl. Dec. 7, 1955. 8p. $.180(ph OTS); $1.80(mf
OTS).

Microgram amounts of U can be determined quantita-
tively by measuring the absorbance of the chloroform ex-
tract of uranyl 8-hydroxyquinolate from neutral uranyl
solutions at 380 mμ. (auth)

3568   Y-87
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak
    Ridge, Tenn.
R [U^{235}] RECOVERY BY SCRAPING AND VACUUMING
TECHNIQUES. J. M. Googin and M. C. Wiest. Dec. 19,
1947. Decl. Dec. 6, 1955. 8p. Contract [W-7405-eng-26.]
$1.80(ph OTS); $1.80(mf OTS).

The feasibility of recovering U^{235} material by manually
scraping and vacuuming the U^{235} carbons was investigated.
Experimental results indicate that the overall recovery
attainable by this method is about 5% higher as compared
to the carbon-burning process. (auth)

3569   Y-112
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
CHLORINE ($_{17}C^{138}$) TRACER STUDIES. PART I. URANIUM
TRIOXIDE–HEXACHLOROPROPENE REACTION MECHA-
NISM. PART II. EXCHANGE REACTIONS OF SEVERAL
ORGANIC CHLORIDE–INORGANIC CHLORIDE SYSTEMS.
D. A. Lee and R. W. Woodard. Jan. 12, 1948. Decl. Dec.
7, 1955. 18p. Contract [W-7405-eng-26]. $3.30(ph OTS);
$2.40(mf OTS).

Investigations of the reaction of UO_3 with hexachloropro-
pene indicate that the reaction product UCl_5 undergoes
rapid chlorine exchange with hexachloropropene. Several
reactions involving the exchange of Cl_2 between chloroform
and inorganic chlorides are described. The synthesis of
Cl^{36}-labeled $CHCl_3$ is outlined. (C.W.H.)

3570   Y-161
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
PREPARATION AND PROPERTIES OF MOLTEN AND
FUSED URANIUM TETRACHLORIDE. R. H. Adams and
J. S. Reece. March 29, 1948. Decl. Dec. 6, 1955. 48p.
Contract W-7405-eng-26. $7.80(ph OTS); $3.30(mf OTS).

Research and development studies involving the prepara-
tion of molten and fused UCl_4 are reported. Methods of
preparation of fused charges for track operation, and the

operating characteristics of these charges were examined.
The corrosion effect of molten UCl_4 was studied and the
ability of various materials of construction to withstand
attack are compared. Methods of melting UCl_4 in carbon
and glass containers for loading H-bottles with molten
charge were studied. The application of a carbon-resistance
heater for melting UCl_4 was examined. Determinations of
the specific gravity of fused UCl_4 and of the electrical
conductivity of molten UCl_4 are discussed. An explanation
of the development of stick-feed production methods and
plans for further work are included. (auth)

3571   Y-184
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
EXCHANGE OF URANIUM BETWEEN U^{+2} AND UO_2^{+2} IN
DILUTE ACID SOLUTION. R. W. Woodard, D. A. Lee,
and J. S. Drury. June 21, 1948. Decl. Dec. 6, 1955. 25p.
Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

By the use of tracer technique it was found that under
certain conditions an interchange of U atoms takes place
between uranous, U^{+4}, and uranyl, UO_2^{+2}, ions. Quantitative
experiments were carried out to find the effect of various
factors on the rate of U interchange. The factors investi-
gated were H ion concentration, temperature, and light.
A mathematical treatment of the exchange process was
made which conforms with experimental results. (auth)

3572   Y-286
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak
    Ridge, Tenn.
THE STUDY OF EVAPORATION OF ACID MACHINE WASH
AND EXTRACTION OF URANIUM FROM THE CONCEN-
TRATE WITH DIETHYL ETHER. A. D. Ryon and E. J.
Lord. Nov. 12, 1948. Decl. Dec. 6, 1955. 11p. Contract
W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

Acid machine wash can be evaporated to $\frac{1}{10}$ of the
original volume and, under proper conditions, the chloride
and acid content of the concentrate are favorable for sub-
sequent extraction of the U with ether. This permits a
reduction in the size of extraction equipment and a saving
in the amount of aluminum nitrate consumed. (auth)

3573   Y-315
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
SOLUBILITY OF URANYL AMMONIUM PHOSPHATE IN
NITRIC ACID AND AMMONIUM NITRATE SOLUTIONS AS
A FUNCTION OF TEMPERATURE. A. D. Ryon and D. W.
Kuhn. Jan. 10, 1949. Decl. Dec. 6, 1955. 25p. Con-
tract W-7405-Eng-26. $4.80(ph OTS); $2.70(mf OTS).

The solubility of $UO_2NH_4PO_4 \cdot 3H_2O$ in 0.8$\underline{M}$ to 1.6$\underline{M}$
nitric acid increases rapidly as the temperature is in-
creased from 0°C to about 80°C, at which point a transition
to $(UO_2)_3(PO_4)_2 \cdot 4H_2O$ occurs. The latter compound exhibits
retrograde solubility as the temperature is increased
above 80°C. The solubility of $UO_2NH_4PO_4 \cdot 3H_2O$ was found
to be linearly dependent upon the concentration of nitric
acid. The presence of ammonium ion greatly represses
the solubility at temperatures below the transition point.
(auth)

3574   Y-381
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
SOLUBILITY OF URANYL AMMONIUM PHOSPHATE.
A. D. Ryon and D. W. Kuhn. Apr. 1, 1949. Decl. Dec. 6,

1955. 22p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

The solubility of uranyl ammonium phosphate, $UO_2NH_4PO_4 \cdot 3H_2O$ in $NH_4NO_3-HNO_3$ solutions at 25 and 70°C was determined. The effects of excess PO_4^{3-} and UO_2^{2+} on the solubility were investigated. The solubility of uranyl phosphate $(UO_2)_3(PO_4)_2 \cdot 4H_2O$ was determined at 96°C in various solvents. (C.W.H.)

3575 Y-409
Carbide and Carbon Chemicals Corp. Y-12 Plant,
    Oak Ridge, Tenn.
DIRECT REDUCTION OF URANIUM HEXAFLUORIDE TO
METALLIC URANIUM. D. E. Carpenter, C. P. Johnston,
and C. D. Susano. May 16, 1949. Decl. Dec. 8, 1955.
5p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80
(mf OTS).

Exploratory tests are reported which indicate the feasibility of a one-step reduction process for the preparation of uranium metal from the hexafluoride by the action of calcium metal and iodine. (auth)

3576 Y-478
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
RATE OF EXCHANGE OF URANIUM BETWEEN URANOUS
AND URANYL IONS IN AQUEOUS SOLUTION. D. G. Hill.
Sept. 2, 1949. Decl. Dec. 6, 1955. 16p. Contract W-7405-
Eng-26. $3.30(ph OTS); $2.40(mf OTS).

A mechanism is proposed for the reaction on the assumption that the rate measured is the rate of combination of U^{4+} and UO_2^{2+} to form UO_2^+. The measured dependence of the reaction rate upon acidity is that predicted by this mechanism. The reaction rate constant is calculated from the equilibrium constant and from the rate constant for the reverse reaction. Mathematical expressions are derived for comparing the results of other workers with those obtained here. It is suggested that an error resulting from the neglect of oxidation may explain some discrepancies in published results for the order of the reaction. (auth)

Refer also to abstracts 3444, 3446, 3496, and 3612.

WASTE DISPOSAL

3577 K-273
Carbide and Carbon Chemicals Corp. K-25 Plant,
    Oak Ridge, Tenn.
A PROPOSAL FOR TAKING SAMPLE OF UNNEUTRAL-
IZED WASTE. A. A. Abbatiello. Sept. 17, 1948. Decl.
Dec. 27, 1955. 10p. Contract [W-7405-eng-26]. $1.80
(ph OTS); $1.80(mf OTS).

A method for taking a 100 ml sample of high-activity waste from a sampling station is proposed. Special precautions are necessary because of the high level of radiation. Equipment has been designed, built, and tested as far as practical. (auth)

3578 K-316
Carbide and Carbon Chemicals Corp. K-25 Plant,
    Oak Ridge, Tenn.
SLUDGE SAMPLING SYSTEM. A. A. Abbatiello. Dec. 9,
1948. Decl. Dec. 27, 1955. 16p. Contract [W-7405-eng-
26]. $3.30(ph OTS); $2.40(mf OTS).

A clamshell-type sludge sampler was designed and built at K-25 and used at Hanford to obtain specimens of radio-active materials at predetermined depths from the metal waste tanks T-101, T-102 and T-103. Construction of the device and experience in its use at Hanford are described. Data on some of the physical and radiochemical properties of the samples obtained are tabulated. (auth)

3579 K-416
Carbide and Carbon Chemicals Corp. K-25 Plant,
    Oak Ridge, Tenn.
RECOVERY OF URANIUM FROM HANFORD WASTE BY
PRECIPITATION AS URANIUM TETRAFLUORIDE AND
SUBSEQUENT FLUORINATION. H. A. Bernhardt, S.
Bernstein, and F. D. Rosen. June 10, 1949. Decl. Dec.
27, 1955. 16p. (KLO-107). $3.30(ph OTS); $2.40(mf OTS).

Uranium may be recovered from Hanford waste by precipitation as UF_4 and subsequent fluorination to UF_6. This treatment has been used to obtain separation of all the fission products, except Ru^{106}, from the U. Activity due to the Ru was reduced to a value of 1 mc/kg of U. (auth)

3580 Y-471
Carbide and Carbon Chemicals Corp. Y-12 Plant,
    Oak Ridge, Tenn.
URANIUM CONTENT OF SEWAGE SLUDGE; OAK RIDGE
DISPOSAL PLANTS. L. J. Brady and C. D. Susano. Aug.
10, 1949. Decl. Dec. 6, 1955. 10p. Contract W-7405-
Eng-26. $1.80(ph OTS); $1.80(mf OTS).

Results of tests are given on the U content of sludge which is produced at the Oak Ridge sewage disposal plants. The sludge produced at the West Plant is reported to contain 25 to 50 ppm of U, and that produced at the East Plant is reported to be of the order of 5 to 10 ppm. (auth)

ENGINEERING

3581 AECD-3901
[Oak Ridge National Lab., Y-12 Area, Tenn.]
[OPERATING PROCESS FOR CANNING OF X-10 SLUGS.]
[nd]. Decl. Dec. 8, 1955. 33p. Contract [W-7405-eng-26].
(Y-B58-1). $6.30(ph OTS); $3.00(mf OTS).

3582 M-3845
General Cable Corp., Bayonne, N. J.
DESIGN, PRODUCTION, AND TERMINATION OF POWER
SUPPLY CABLE. E. Richman. [194?]. Decl. Nov. 28,
1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

The power supply cables were designed with all elements having a concentric configuration. A varnished cambric insulation was used. The requirements, selection of insulation walls, and other design features are discussed. (J.E.D.)

3583 M-3846
Kerite Co., New York.
HIGH VOLTAGE KERITE CABLES FOR ELECTROMAG-
NETIC PLANT. Alan Standish Dana. [194?]. Decl. Nov.
28, 1955. 22p. $4.80(ph OTS); $2.70(mf OTS).

Many novel types of high voltage d-c cables were designed and manufactured in a very short period of time and an improved type of open terminals was developed. Considering the severity of the voltage stresses to which the cables were subjected, and the lack of information during the cable manufacturing period, the performance of both cables and terminals was quite satisfactory. When the ex-

traneous oscillations were reduced by suitable methods, the performance of cable and terminal was improved. (auth)

HEAT TRANSFER AND FLUID FLOW

3584   A-381
National Bureau of Standards, [Washington, D. C.]
HEAT TRANSFER COEFFICIENT FOR HYDROGEN FLOWING THROUGH A TUBE AT LOW TEMPERATURES. H. W. Woolley and F. G. Brickwedde. [194?]. Decl. Dec. 8, 1955. 8p. $1.80(ph OTS); $1.80(mf OTS).

A study was made to determine the coefficient h in the equation $dQ/dt = h\Delta\theta$ for the rate of flow, dQ/dt, of heat Q from the surface of a smooth, straight, cylindrical, metal tube to gaseous hydrogen at a different temperature θ flow $\cdot \chi$ through the tube at low temperatures under conditions of turbulent flow. (auth)

MATERIALS TESTING

3585   M-4168
[Clinton Labs., Oak Ridge, Tenn.]
PROCESS SOLUTION TRANSFER—TESTING OF STEAM AND AIR JETS. M. D. Peterson. Jan. 30, 1945. Decl. Nov. 29, 1955. 93p. $15.30(ph OTS); $5.40(mf OTS).

Seven steam and air jets of different designs were tested for performance in the transfer of process solutions. Data are presented on the design, test set-up, and characteristic curves of the jets tested. (C.H.)

PUMPS

3586   K-101
Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.
KINNEY PUMP OILS. C. B. Clifford, M. I. Lundin, and T. Shapiro. Dec. 4, 1947. Decl. Nov. 29, 1955. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Performance tests were run in order to determine the relative costs and efficiency of Hi-Vac #3 (Vacuum Oil) and NS-2075 (Lube Oil) in the process area Kinney vacuum pumps. As a result of these tests it has been proven that the reclaimed Hi-Vac #3 now being used is directly responsible for a high percentage of the carbonization taking place in the pumps and materially contributes to their failure. Test data is presented to show that NS-2075 oil meets all operating requirements without carbonizing in the Kinney pumps. (auth)

3587   KAPL-130
Knolls Atomic Power Lab., Schenectady, N. Y.
THEORY OF THE PUMP-MIX MIXER SETTLER. Chemical Engineering Laboratory Report No. 5. J. K. Davidson. Mar. 11, 1949. Decl. Dec. 5, 1955. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Equations are derived which describe the hydraulic relations, the impeller characteristics, and the settling relations of the pump-mix mixer settler. (auth)

3588   KLX-1036
Kellex Corp., New York
REPORT OF THE INSTRUMENT AND MECHANICAL DEVELOPMENT DEPARTMENT ON "CANNED" MOTORS AND "CANNED" MAGNETIC COUPLINGS. Job 15. June 30, 1949. Decl. Dec. 6, 1955. 41p. Contract W-31-109-eng-52, Subcontract G-148. $7.80(ph OTS); $3.30(mf OTS).

The development of canned fractional-horsepower motors suitable for application to rotating pumps is reported. The development of these motors was part of a program to develop leakproof rotating pumps for transfer service in Redox plants. Such a motor consists of a stainless-steel-encased rotor running in a stainless-steel tube, separating the stator laminations and windings from the area about the rotor. Process fluids may be pumped through the rotor gap and the hollow rotor shaft. An integral unit of motor and pump may thus be obtained in which the pumped fluid flows through the pump. Four models of canned motors were fabricated and tested. Drawings and performance data are presented. Canned magnetic couplings suitable for driving rotary pumps or agitators were developed. Magnetic couplings consist of driven and driving members mounted on separate shafts and bearings. The driving member is coupled to a prime-mover and the driven member to the equipment. The two members are linked magnetically but not physically. A coupling that has a high starting and slipping torque in addition to good synchronous or near synchronous torque is required. Specifications, drawings, and test results are included for several models of induction couplings. (C.H.)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

3589   AECD-3847
California Research and Development Co., Livermore, Calif.
CERAMIC-BASED MATERIALS FOR HIGH TEMPERATURE SERVICE. W. A. Bates. June 11, 1951. Decl. Dec. 3, 1955. 12p. (CRD-T2B-20). $3.30(ph OTS); $2.40(mf OTS).

The properties and fabrication of high-temperature refractory ceramics are discussed. Physical, chemical, and tensile properties of several ceramic materials are tabulated. (auth)

3590   AECD-3951
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE PREPARATION AND ANALYSIS OF THE CARBIDES OF Ta, Be, Zr, AND Th. E. W. Boulger, J. W. Sausville, and C. E. Larson. Sept. 19, 1945. Decl. Dec. 22, 1955. Contract W-7401-eng-23. (C-0.380.1). $1.80(ph OTS); $1.80(mf OTS).

Carbides of Th, Ta, Be, and Zr were prepared from the oxides of these metals by reaction with graphite in the induction furnace. Methods for the analysis of these compounds are given. (auth)

3591   ANL-4177
Argonne National Lab., Lemont, Ill.
THE VOLATILIZATION OF BERYLLIA IN WATER VAPOR. M. G. Berkman and S. L. Simon. July 15,

1948. Decl. Dec. 14, 1955. 23p. Contract W-31-109-eng-38. $4.80(ph OTS); $2.70(mf OTS).

The effects of variation of temperature, steam pressure, mass flow rate and volume flow rate, BeO sample area, and vapor composition on the reaction rate of BeO with steam are summarized. (C.W.H.)

CORROSION

3592 AECD-3896
[Tennessee Eastman Corp., Oak Ridge, Tenn.]
CORROSION TESTS ON Al ALLOYS. H. W. Winkler. Mar. 8, 1946. 8p. Decl. Dec. 15, 1955. Contract [W-7401-eng-23]. (CD-5560). $3.30(ph OTS); $2.40(mf OTS).

Results of corrosion tests on Al alloys in HDO containing Cl^- indicate that the initial high corrosion rate decreases with time due to formation of a protective coating and that the Al corrosion rate is independent of the Cl^- concentration. (C.W.H.)

3593 CN-2834
[Chicago. Univ. Metallurgical Lab.]
CORROSION TESTS. Progress Report for the Period November 15, 1944 to April 15, 1945. N. R. Glarum and W. H. Baldwin. June 20, 1945. Decl. Dec. 22, 1955. 11p. Contract W-7406-eng-39. $3.30(ph OTS); $2.40(mf OTS).

3594 HW-12552
[Hanford Works, Richland, Wash.]
CORROSION TESTS ON TANTALUM, HASTELLOY C AND DURIRON IN 234-5 PROJECT SOLUTIONS. J. B. Work and W. W. Koenig. Feb. 25, 1949. Decl. Dec. 12, 1955. 9p. [Contract W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Static immersion and vapor suspension corrosion tests were conducted with Duriron, Hastelloy C, and Ta in hydriodic acid and synthetic 234-5 project process supernatant solution at room and elevated temperatures. Data are tabulated on the physical and mechanical characteristics of the metal and alloys, and on the composition and corrosive effects of the liquids. The 234-5 project process supernatant solution contained, among other things, 103 g/l of HI. (C.H.)

3595 HW-15829
Hanford Works, Richland, Wash.
CORROSION OF CONSTRUCTION MATERIALS IN 234-5 PROJECT SOLUTIONS. W. W. Koenig. Jan. 31, 1950. Decl. Dec. 7, 1955. 21p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Laboratory corrosion studies of a number of materials to determine their suitability for use in construction equipment were made. Tantalum was the only metallic material completely satisfactory. Of the non-metallic materials, fluorothene and teflon showed satisfactory resistance. Laboratory tests are described and the results tabulated. (J.E.D.)

3596 HW-20765
Hanford Works, Richland, Wash.
CORROSION TESTS ON STAINLESS STEEL PLATE-WASTE METAL RECOVERY PROCESS. Kenneth L. Sanborn. Apr. 9, 1951. Decl. Dec. 7, 1955. 5p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mc).

Significant improvement in the resistance of 347 stainless steel to boiling 65% HNO_3 was obtained by annealing for 4 hr at 1650°F, followed by a water quench. Less improvement was noted when the plate was annealed for $\frac{1}{2}$ hr at 1975°F followed by air cooling. (K.S.)

3597 K-373
Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn.
CORROSION OF VARIOUS METALS IN HYDROFLUORIC-SULFURIC ACID SOLUTIONS OF SYNTHETIC HANFORD WASTE. H. A. Bernhardt, W. Davis, Jr., and J. R. Flanary. Mar. 18, 1949. Decl. Dec. 23, 1955. 20p. Contract [W-7405-eng-26]. (KLO-87). $3.30(ph OTS); $2.40(mf OTS).

The precipitation of uranium as uranium tetrafluoride from hydrofluoric-sulfuric acid solutions of Hanford waste as a method of uranium recovery has imposed the problem of determining the type of metal that can be used for reactors. Nickel, monel metal and four stainless steels have been tested for their resistance to corrosion by such acid solutions. Nickel and monel corrode at rates of 0.019 and 0.062 in./year. The former shows extensive flaking after about 20 days exposure. The stainless steels are quite corrosion resistant, varying in the ranges of 0.0032 in./year for 302 stainless, about 0.001 in./year for 304 and 316 stainless steels, and 0.00007 in./year for 25-12 (Nb stabilized) stainless steel. A comparison of observed corrosion rates with an estimated maximum allowable corrosion rate of 0.01 to 0.05 in./year suggests that all the stainless steels tested would meet this requirement while monel and Ni would not. Welding has little effect on the corrosion rates of 304 and 316 stainless steels, the only welded steels tested. (auth)

3598 M-4585
[Ames Lab., Ames, Iowa.]
CORROSION OF THORIUM AND RELATED MATERIALS. J. G. Feibig. [194?] Decl. Dec. 8, 1955. 28p. Contract [W-7405-eng-82]. Based on CC-2400 and CC-2715. $4.80(ph OTS); $2.70(mf OTS).

A study of the corrosion of Th and related materials in both air and water at various temperatures was made. By varying the method of treating the sample after exposure to water, it was found that values obtained by polishing the sample with either a non-metal-cutting cloth or an abrasive wheel were more reliable than those obtained by other methods. The effects of coupling, acid and salt solutions, and temperature were investigated. The coupling of Al and Th had little effect on the corrosion rate of Th but elevation of the temperature caused an increase in the rate of corrosion. Partial disintegration of the samples occurred in solutions containing acid and dissolved salts. Alloys of Th were found to be less resistant to corrosion than was the unalloyed metal. All alloys of uranium partially disintegrated during the tests. By exposing Th and a Th-Be alloy to air at various temperatures it was observed that both metals corroded appreciably, but the alloy was corroded to a lesser extent than was the unalloyed Th. A preferential corrosion of one phase of the alloy took place, but the phase most seriously attacked could not be identified. (auth)

3599 NYO-5129
Mallinckrodt Chemical Works, St. Louis.
CORROSION TESTS ON STEELS IN AAA [PITCHBLENDE] LIQUORS. E. T. Furnas. June 26, 1945. Decl. Dec. 7, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

Samples of 304, 316, 317, and 347 stainless steel were immersed in acid leach precipitate solutions of pitchblende

ore. The four steels tested showed little difference in corrosion resistance to the liquor. (L.M.T.)

Refer also to abstract 3611.

GEOLOGY AND MINERALOGY

3600   Y-414

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
A STATISTICAL ANALYSIS OF FACTORS AFFECTING THE FLUORIMETRIC DETERMINATION OF URANIUM IN OIL SHALE. Roberta L. McCutchen and C. D. Susano. May 26, 1949. Decl. Dec. 6, 1955. 19p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

A statistical evaluation of the oil shale data indicated that neither particle size nor preliminary treatment of the sample was critical. A close control of the fluorimetric method of analysis by means of quality control charts is recommended to improve the precision and reliability of the test results. (auth)

METALS AND METALLURGY

3601   A-2950

[Columbia Univ., New York].
HEAT TREATMENT OF A URANIUM−2% MOLYBDENUM ALLOY. J. E. Chaffey. May 1947. Decl. Dec. 3, 1955. 59p. Contract W-28-094-eng-10. $7.80(ph OTS); $3.30(mf OTS).

Experiments and data on the heat treatment of a U−2% Mo alloy are summarized. It is concluded that a eutectoid reaction exists at 600°C, that the fineness of the lamellar structure is affected by the cooling rate, that the γ phase may be retained at room temperatures by relatively slow quenches, that increased hardness and strength are due to precipitation from the supersaturated γ phase, that tempering treatments cause transformation from the γ to the α phase, and that isothermal treatments did not produce any great change in microstructure except for very long times. (B.J.H.)

3602   AECD-3891

Oak Ridge National Lab., Tenn.
THE PROPERTIES OF ZIRCONIUM AND ITS POSSIBILITIES FOR THERMAL REACTORS. Harold B. Fairchild. Jan. 7, 1949. Decl. with deletions Jan. 5, 1956. 106p. Contract W-7405-eng-26. $16.80(ph OTS); $5.70(mf OTS).

Included are general discussions of the nuclear, physical, mechanical, and chemical properties of Zr, the production and fabrication of Zr, methods of analysis of Zr, and its corrosion resistance. (B.J.H.)

3603   AECD-3903

National Bureau of Standards, Washington, D. C.
QUARTERLY PROGRESS REPORT TO THE ATOMIC ENERGY COMMISSION FOR OCTOBER, NOVEMBER, AND DECEMBER 1954. April 1955. Decl. Dec. 7, 1955. 104p. (NBS-D-131). $15.30(ph OTS); $5.40(mf OTS).

Data or results are presented for the following studies: electrodeposition of Be−Mg alloys from ethereal solutions of MgAl hydride and Be borohydride; electrodeposition of Al−Mg alloys using tetrahydrofuran and diethyl ether as solvents; preparation of Be borohydride; synthesis of phenylene sulfides, perfluoroaromatic compounds, and meta-linked polyphenyls; phase studies on Pt−U and Ru−U alloys of various compositions; preparation and testing of urania and thoria ceramics; physical properties of UO_2 and THO_2; and elastic properties of Ni-bonded Te carbide specimens. (L.M.T.)

3604   AECD-3916

California Research and Development Co., Livermore, Calif.
MATERIALS HANDBOOK. PART III−LOW TIN ZIRCONIUM ALLOYS. H. Majors, Jr., R. T. Webster, G. E. Wendell, and R. H. Wallace. Jan. 29, 1953. Decl. Dec. 20, 1955. 33p. (CRD-A19-27(pt. 3)). $6.30(ph OTS); $3.00(mf OTS).

The mechanical and physical properties of low Sn−Zr alloys are outlined. (C.H.)

3605   AECD-3949

California Research and Development Co., Livermore, Calif.
MATERIALS HANDBOOK. PART V. PROPERTIES OF THORIUM. George E. Wendell, Harry Majors, Jr., R. H. Wallace, and R. T. Webster. May 6, 1953. Decl. Dec. 19, 1955. 78p. (CRD-A19-27(pt. 5); LWS-22514(pt. 5)). $12.30(ph OTS); $4.50(mf OTS).

Data are summarized on many mechanical and physical properties of Th. Most of the material in this report is also contained in Vol. 3 of the Reactor Handbook. (B.J.H.)

3606   CF-52-6-33

Oak Ridge National Lab., Tenn.
COLUMBIUM. H. Inouye. June 4, 1952. Decl. Dec. 16, 1955. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Information obtained from a literature survey on the physical properties and gaseous reactions of Nb and the properties of Nb alloys is summarized. (B.J.H.)

3607   CF-54-3-171

Oak Ridge National Lab., Tenn.
THE DECONTAMINATION OF STAINLESS STEEL. Progress Report. D. O. Campbell. Mar. 16, 1954. Decl. Dec. 20, 1955. 30p. $4.80(ph OTS); $2.70(ph OTS).

The contamination on stainless steel exposed to Purex process solutions is predominantly Nb. Besides being the predominant initial contaminant, Nb appears to be the most difficult to remove. The rate of decontamination with time of treatment is reported for nitric acid, oxalic acid, Na hydroxide, Na tartrate in Na hydroxide, and a solution of Na tartrate, hydrogen peroxide, and Na hydroxide. Nitric acid is the least effective; alkaline tartrate peroxide is the most effective. The reagents decontaminate rapidly at first, but the rate drops to about 6% removal per day after several days. Contamination from dilutions of the Purex process waste solution follows the Freundlich adsorption isotherm relationship between the amount of radioactivity adsorbed and its concentration in the contamination solution. The addition of a fluoride solution of stable Nb and Zr to the contamination solution decreases the gamma contamination by decreasing that of Nb and Zr. Ruthenium then becomes relatively important. However, it is difficult to get Nb into solution with nitric acid alone. Hydrofluoric acid (3%) in nitric acid (20%) is the most effective decontamination reagent tested. It is also severely corrosive to stainless steel, although it does not produce interganular corrosion or serious pitting.

Ultrasonic radiation of high enough intensity increases the rate of decontamination. (auth)

3608 CP-1837

[Chicago. Univ.] Metallurgical Lab.

SEALING OF HOLES IN ALUMINUM SHEET BY OXIDATION. S. Anderson and N. Goldowski. July 15, 1944. Decl. Jan. 5, 1956. 30p. Contract W-7401-eng-37. (A-2661). $4.80(ph OTS); $2.70(mf OTS).

An investigation is made of the conditions under which holes in Al may be expected to close by oxidation while in use in reactors. A brief theoretical discussion is given of the mechanism of oxidation of Al. Preliminary experimental results on plugging by chemical oxidation and by corrosion are summarized. It is concluded that under the most favorable conditions, only small holes may be sealed by oxidation processes. (B.J.H.)

3609 CT-1571

Battelle Memorial Inst., Columbus, Ohio.

METALLURGY OF TUBALLOY. Progress Report. Apr. 1, 1944. Decl. Dec. 13, 1955. 78p. Contract [W-7405-eng-92]. (A-2239) $9.30(ph OTS); $3.60(mf OTS).

Thermal expansion measurements between room temperature and 750°C were made on longitudinal specimens of γ- and α-extruded metal, on transverse specimens of γ-extruded metal, and on biscuit metal. The inherent anisotropy of the metal and of the specimens is probably the cause of the peculiar dilatation behavior that is observed in the α region and in the α-β transformation. The metal is characterized by a tendency for slow isothermal dilatation in the medium and high α region and in the α-β transformation. Anisotropic properties of specimens account for much of the discordant expansion coefficient data. In a sample of commercially extruded and outgassed metal, the transverse expansion coefficient in the α was initially high, while the longitudinal coefficient was low. Cycling through the lower transformation tended to bring the coefficients in the two directions together. A single heating-cooling cycle with this sample of extruded metal results in a permanent transverse expansion and longitudinal contraction. Nickel plate on Al has been found adequate to prevent alloying when hot Zn-dipping, 0.0005-in. thickness being resistant up to five minutes in the Zn bath at 450°C. When Cr is plated over Ni, the Cr apparently dissolves, but prevents alloying with the Ni. Anodizing in a H_3PO_4 solution with HCl produces a surface which can be plated with adherent Ni deposits. Smoother deposits are obtained than with trichloracetic acid. The production of Be reinforcements for end caps appears favorable using powder metal processes. Machining results in a high metal loss, and a rolled 50-50 Be$-$Al alloy does not appear promising. Measurements were made of the elastic constants of U at stresses up to 18,000 psi. Beyond this stress, yielding was too pronounced to warrant attempts to measure elasticity. It was found that Young's modulus varied from 23.8×10^6 to 13.9×10^6 psi and Poisson's ratio from 0.38 to 0.39 in one sample, while in another Young's modulus varied from 27×10^6 to 17.8×10^6 psi and Poisson's ratio from 0.38 to 0.43. Cracked bars occurring in extrusion are believed to be caused by high impurity content, particularly Fe, as a result of a study of samples obtained from Revere. Spun Al closures have been made for development work on welding for the final seal. (auth)

3610 LA-44

Los Alamos Scientific Lab., N. Mex.

URANIUM ALLOY DEVELOPMENT. PART II. A. U. Seybolt, C. S. Smith, L. B. Stark, and J. Koehl. Dec. 14, 1943. Decl. Dec. 13, 1955. 26p. Contract [W-7405-eng-36]. $4.80(ph OTS); $2.70(mf OTS).

The work on U$-$Mo alloys has been extended to cover a few more compositions. Maximum hardness is obtained with a molybdenum content of about 3%. A suitably heat-treated 3% alloy has a yield strength in compression of the order of 200,000 lb/in^2. The carbon impurity (Ca 0.1%) has a pronounced hardening effect on uranium. Minimum hardness is obtained by furnace cooling, and maximum hardness on reheating for about 2 hr at 250 to 300°C, following a water quench from 900°C. (auth)

3611 MIT-1090

Massachusetts Inst. of Tech., Cambridge. Metallurgical Project.

CORROSION TESTING OF ZIRCONIUM IN WATER AT TEMPERATURES BELOW 600°F. D. S. Kneppel. Apr. 22, 1952. Decl. Dec. 8, 1955. 9p. Contract AT(30-1)-981. $1.80(ph OTS); $1.80(mf OTS).

Unalloyed graphite-melted zirconium has not corroded after seven to ten months in 350°F water. At this temperature higher amounts of impurities (e.g., N_2, C, Ti, Al) can be tolerated than at 600°F. However, at 450°F it appears necessary to add a small amount of tin (e.g., 1 wt.%) or other alloying agent to guarantee corrosion resistance of graphite-melted zirconium. (auth)

3612 NYO-5225

Mallinckrodt Chemical Works, St. Louis.

THE RETENTION OF COPPER AND NICKEL IN THE PRECIPITATION OF URANYL AMMONIUM PHOSPHATE. Joseph R. Simmler. Apr. 6, 1948. Decl. Dec. 2, 1955. 6p. $1.80(ph OTS); $1.80(mf OTS).

As part of the systematic examination of the U assay procedure for ores used at the Mallinckrodt Chemical Works, it was desired to know how much Cu and Ni were retained by the U as it is precipitated as uranyl ammonium phosphate. The U is precipitated as the phosphate to separate it from most of the Ni and the bulk of the other constituents that are soluble as phosphates at a pH between 4 and 5. Colorimetric procedures are described for the determination of Cu and Ni retained by the U when precipitated as uranyl ammonium phosphate from ore samples. (C.H.)

3613 SO-3003

Rensselaer Polytechnic Inst., Troy, N. Y. Powder Metallurgy Lab.

ELECTRIC RESISTANCE SINTERING. A. B. Backensto, Jr., N. F. Hopson, and F. V. Lenel. Apr. 30, 1951. Decl. Dec. 6, 1955. 22p. Contract AT(30-3)-37. $4.80(ph OTS); $2.70(mf OTS).

Fe$-$Al compacts consisting of a core containing a mixture of Fe shot and Al powder surrounded by a case of pure Al powder have been extruded. Results are indicated by tabular extrusion data and photomicrographs. Sintered Zr compacts have been extruded in a resistance sintering machine using a tungsten wafer as an extrusion die. The resistance sintering technique has been applied to graphite in an attempt to produce graphite of a high density for use in nuclear reactors. (B.J.H.)

3614   SO-300b

Rensselaer Polytechnic Inst., Troy, N. Y. Powder
  Metallurgy Lab.

POWDER METALLURGY OF BERYLLIUM. A. B.
Backensto, Jr., N. F. Hopson, and F. V. Lenel. Dec. 31,
1951. Decl. Nov. 29, 1955. 29p. Contract AT(30-3)-53.
$4.80(ph OTS); $2.70(mf OTS).

The production of composite bodies consisting of Be and
another substance having greater ductility than Be is dis-
cussed. The KAPL method for copper plating metallic Be
is outlined; it was found to be successful in plating Al
powder (as a stand-in for Be) with coatings of Zn and Cu,
but it is not applicable to Be powder when it is immersed
in a zincate solution. Cu can be deposited on Be powder
by electroplating in a Cu cyanide bath. It is also possible
to deposit Cu on Be powder by displacement when the Be
powder is immersed in a solution of Cu sulfate. No prior
solvent cleaning or acid etching of the Be powder is
necessary. The amount of Cu deposited can be controlled
by controlling the concentration of the sulfate solution.
Cu-coated Be powder containing 31% by weight of Cu was
compacted and sintered by electrical resistance sintering.
The compacts were quite strong but did not show any
appreciable ductility in a transverse rupture test. The
installation of equipment for safe handling of Be powder
and also the health physics tests which were conducted to
demonstrate its efficient functioning are described in an
appendix. (J.E.D.)

3615   WAPD-84

Westinghouse Electric Corp. Atomic Power Div., Pitts-
  burgh.

EXPLOSIONS INVOLVING PICKLING OF ZIRCONIUM
AND URANIUM ALLOYS. W. J. Hurford. May 28, 1953.
Decl. Jan. 6, 1956. 18p. Contract AT-11-1-GEN-14.
$3.30(ph OTS); $2.40(mf OTS).

Reports are submitted in a consolidated form by
individual laboratories on explosion hazards involved in
etching and pickling Zr and U and their alloys. (J.A.G.)

PHYSICS

3616   AECD-3864

Westinghouse Electric Corp. Atomic Power Div.,
  Pittsburgh.

THERMAL CONDUCTIVITY OF REACTOR FUEL ELE-
MENT MATERIALS. R. C. Westphal. June 23, 1954.
Decl. Dec. 6, 1955. 4p. (WAPD-MM-538). $1.80(ph
OTS); $1.80(mf OTS).

Thermal conductivities are presented for the following
reactor fuel element materials: $BeO-UO_2$, $Cr-U$, $Mo-U$,
$Th-U$, $Sn-Zr$, U, UO_2, $U-Zr$, and Zr. (C.W.H.)

AEROSOLS

3617   MLM-188

Mound Lab., Miamisburg, Ohio.

THE APPLICATION OF TYPE 6 FILTER PAPER FOR THE
REMOVAL OF AIRBORNE ALPHA EMITTING CONTAMI-
NATION. R. Endebrock. Apr. 18, 1947. Decl. Dec. 7,
1955. 35p. Contract AT-33-1-GEN-53. $6.30(ph OTS);
$3.00(mf OTS).

A determination was made of the efficiency of paper

filters in removing airborne α-emitting contamination at
various levels of contamination and of the operational
pressure differentials of Type 6 filter paper. Other
pertinent data were also collected. Results give the aver-
age efficiency of Type 6, single-thickness paper, for 21
runs as 94.5% and for 12 runs on double thickness paper
as 96.6%. (B.J.H.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3618   CC-2123

Chicago. Univ. Metallurgical Lab.

THIRD FORM OF BISMUTH PHOSPHATE—X-RAY STUDY.
Rose C. L. Mooney. Sept. 7, 1944. Decl. Dec. 15, 1955.
9p. Contract [W-7401-eng-37]. $1.80(ph OTS); $1.80(mf
OTS).

In addition to the hexagonal and the monoclinic bismuth
phosphate precipitates, whose structures are now known,
a third crystalline phase has been found to appear in
$BiPO_4$ precipitates after extremely long digestion in con-
centrated nitric acid and oven drying at 800 to 1000°.
Though very small single crystals of this component
have been isolated, no crushed sample contained less
than 30% of the β form. The cell size and symmetry of the
crystal indicates that there are two bismuth atoms in the
cell, and there is no evidence that the compound is not
$BiPO_4$. It is suggested that this may be a third form of
$BiPO_4$, stable over a short range of conditions, and
tending to revert to the β form. (auth)

Refer also to abstract 3745.

ELECTRICAL DISCHARGE

3619   AECD-3966

Tennessee Eastman Corp., Oak Ridge, Tenn.

THE METAL-DIELECTRIC JUNCTION OF HIGH-VOLTAGE
INSULATORS IN VACUUM AND MAGNETIC FIELD. M.
J. Kofoid, R. S. Alger, and D. Graves. Aug. 8, 1945. Decl.
Dec. 20, 1955. 84p. (D-4,250,13). $13.80(ph OTS);
$4.80(mf OTS).

The metal–dielectric junction of high-voltage insulators
has been investigated in vacuum, with an applied magnetic
field of 3400 gauss and with transient and steady state
voltages. The junction at the negative end of the insulator
is the source of electrical discharges which are associated
with insulator failure. The positive junction has no evident
role in insulator failure. The phenomena at the negative
junction appear to be caused by the extremely high
electric fields produced in the small gaps of the metal-
dielectric contact. The phenomena do not depend upon gas
pressure in the range of 0.1 to 1.0μ, upon electrode
material, or upon contact surface roughness. Metallizing
the ceramic to reduce the contact gap serves only to move
the discharge to the edge of the metallized region. The
threshold voltage for the appearance of the discharge is
raised by an increase in the uniformity of the electric
field at the contact, or by a large decrease in the dielectric
constant of the insulating ceramic. The negative junction
phenomena were markedly reduced in intensity by shaping
the electrode so that the edge of the metal–dielectric con-
tact was in a region of very weak electric field. Practical
electrode design, based upon these results, is discussed
and will be the subject of future study. The threshold

voltage for the junction discharge increases with increasing over-all length of the insulator. However, the factors involved in this relationship are not as yet understood. (auth)

3620   BP-29
California. Univ., Berkeley. Radiation Lab.
HIGH FREQUENCY INSULATOR AND VACUUM CAP BREAKDOWN TESTS. Fred Schmidt. Aug. 13, 1946. Decl. Nov. 28, 1955. 20p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

The Zircon porcelain insulators used to support the 184-in. cyclotron dee and the stator ring of the rotary capacitor were tested at 13 Mc r-f voltage. The tests indicate that, with the insulator water and air cooling called for in the present capacitor designs, the maximum permissible continuous peak voltage appearing at the capacitor will lie between 55 and 65 kilovolts. R-f voltages greater than this will probably result in considerable heating of the insulators. It seems likely, however that gap breakdowns between the blades of the capacitor will present a lower limitation to the voltage than the insulators. (B.J.H.)

INSTRUMENTS

3621   EAH-87
General Electric Co. General Engineering and Consulting Lab., Schenectady, N. Y.
DESIGN PROPOSAL FOR ONE BINOCULAR AND ONE MONOCULAR PERISCOPE FOR HANFORD WORKS. G. R. Rede. Feb. 10, 1949. Decl. Nov. 28, 1955. With this is bound: BINOCULAR PERISCOPE DEVELOPMENT REPORT. Projects C-187 C and D. Norman F. Barnes. Oct. 29, 1948. (EAH-69). 78p. $12.30 (ph OTS); $4.50(mf OTS).

3622   MLM-291
Mound Lab., Miamisburg, Ohio.
ELECTRONICS PROGRESS REPORT [FOR] FEBRUARY 1-28, 1949. Josef W. Heyd and Philip E. Ohmart. Apr. 25, 1949. Decl. Nov. 28, 1955. 36p. Contract AT-33-1-GEN-53. $6.30(ph OTS); $3.00(mf OTS).

A detailed study was made of the frequency response of the linear amplifier used with a boron-wall tube. Detailed views are given of the cathode follower circuit used for coupling the boron-wall tube to its linear amplifier. (B.J.H.)

ISOTOPES

3623   ORNL-388
Oak Ridge National Lab., Tenn.
PRODUCTION OF CARBON 14 FROM AMMONIUM NITRATE SOLUTION IN THE CHAIN REACTOR. A. H. Snell and L. D. Norris. Oct. 19, 1949. Decl. Dec. 7, 1955. 24p. Contract W-7405-eng-26. (deleted version: MDDC-726). $4.80(ph OTS); $2.70(mf OTS).

An apparatus is described for producing useable quantities of C^{14} by circulating NH_4NO_3 solutions through the slow neutron flux of ORNL Graphite Reactor. The radioactive carbon, resulting from the $N^{14}(n,p)C^{14}$ reaction, appears largely as CO and CO_2 which are vented off and ultimately precipitated as $BaCO_3$. (K.S.)

ISOTOPE SEPARATION

3624   A-3957
California. Univ., Berkeley. Radiation Lab.
THE IONIC CENTRIFUGE. [Report for Period] January 1, 1942 to December 31, 1942. J. Slepian. Decl. Dec. 8, 1955. 45p. $7.80(ph OTS); $3.30(mf OTS).

Topics discussed include: an evaluation of the electromagnetic method of isotope separation; the production of ions at electrodes of a vacuum arc; the 1942 theory of the ionic centrifuge; the expected superiority of the ionic centrifuge over other electromagnetic devices; the experimental development of the arc ion source; experiments with the ionic centrifuge; isotope analyses made at Berkeley; results of thirty-three collection runs with the ionic centrifuge; and results from analyses of Berkeley samples made at Columbia. (C.H.)

3625   Y-164
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
THE SEPARATION OF THE STABLE ISOTOPES OF THALLIUM. J. R. Patton and C. P. Keim. Apr. 14, 1948. Decl. Dec. 6, 1955. 35p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

Thallium halides were used as a charge material for the calutron concentration of Th^{203} and Th^{205}. Preparation of the halides and calutron operations are described and illustrated. Data are presented on the chemical analysis, isotopic assays, and inventory quantities following the separation. (C.H.)

3626   Y-228
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
AN EVALUATION OF THE INTERNAL THERMAL FLOW METER FOR MEASURING UCl_4 VAPOR IN THE BETA SOURCE UNIT. Donald Ross, Frank Neill, J. W. Morfitt, and Raymond Murray. Sept. 24, 1947. Decl. Dec. 7, 1955. 20p. Contract W-7405-eng-26. $3.30 (ph OTS); $2.40(mf OTS).

Because the mean free path of the gas particles is so large at the low operating pressures in a calutron beta source unit, no detectible flow of UCl_4 vapor can be observed with the internal thermal flow meter. (auth)

3627   Y-287
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
PREPARATION AND PROPERTIES OF URANIUM TETRACHLORIDE STICKS. Herbert S. Clinton and John S. Reece. Nov. 18, 1948. Decl. Dec. 6, 1955. 35p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

Steps in development of a method of producing sticks of UCl_4 suitable for experimental work on process efficiency are described, and a procedure which will produce satisfactory sticks in large enough numbers to be used for Beta Process experimental work is presented. The charge consumption rate of a calutron unit can not be determined until the unit is terminated. The average charge consumption rate can only be determined after termination, and it can not be determined for any specific period of operation. The Chemical Development Department accepted the responsibility to develop sticks of uranium tetrachloride (stick feed), for the purpose of determining the charge consumption rate for all periods of operation. Extruding

uranium tetrachloride through a small orifice, and casting were tried; casting proved to be a workable method. Casting was improved, and satisfactory sticks can now be produced by that method. (auth)

3628 Y-299

Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
THE 100 KILOVOLT "G" SUPPLY. A. L. Boch. Mar. 4, 1948. Decl. Dec. 7, 1955. 11p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

An experimental "G" supply of 100 kv was constructed for use in investigating high accelerating fields in the calutron. The system consists essentially of two "G" rectifiers operated in series with appropriate auxiliary equipment. Operation of the supply was entirely satisfactory under test conditions with a load of 0.4 amp at 100 kv. The regulation of the supply is 14%. (auth)

3629 Y-352

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
COMPARISON OF VARIOUS METHODS FOR THE REMOVAL OF URANIUM FROM CARBON SALVAGE. L. P. Twichell, P. B. Petretsky, R. D. Williams, and F. B. Waldrop. Feb. 11, 1949. Decl. Dec. 8, 1955. 21p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Experiments were conducted in which the removal of U by nitric acid leaching of ground C salvage was compared with the removal by similar leaching of residues. These residues were the resultant products of four types of pretreatment of C: muffling, burning in continuous carbon burner, heating in an insufficiency of air (coking), and reacting with steam at high temperature. Each sample was subjected to five stages of leaching after pretreatment. Results are presented to show the removal of U at each stage of leaching for the various methods of pretreatment and for different acid concentrations. Results are also given to show the portion of U from each calutron batch remaining in the final leached residue. (auth)

3630 Y-353

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
THE DEVELOPMENT OF EQUIPMENT FOR THE CONTINUOUS BURNING AND LEACHING OF GROUND CARBON. P. B. Petretzky, L. P. Twichell, R. D. Williams, and F. B. Waldrop. Apr. 14, 1949. Decl. Dec. 8, 1955. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40 (mf OTS).

Equipment was developed for the continuous burning and leaching of ground C in order to recover U for the proposed cyclotron closed cycle beta process. The burning apparatus consisted of a vertical tube with a grate to support the C. An updraft of air was used to support combustion. The burning rate of the apparatus was 500 g of C per hr; combustion averaged over 98% complete. The leacher consisted of a heated nitric acid oath divided into four compartments through which ground C was pushed by rotating paddles. The acid flowed, by gravity, countercurrent to the C. (auth)

3631 Y-544

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
ALTERNATE URANIUM CHARGES. Donald Ross and Raymond Murray. Sept. 20, 1948. Decl. Dec. 8, 1955.

14p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40 (mf OTS).

The performance characteristics of several U compounds as charge material for use in the calutron ion source explored included UCl_3, UO_2Cl_2, UBr_3, UH_3, and UI_3. None of these was found to be any better than UCl_4. (auth)

3632 Y-652

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
THE EFFECT OF HIGH MAGNETIC FIELD ON ARC PHENOMENA AND CALUTRON PERFORMANCE. R. L. Murray and M. Wallis. Apr. 1, 1948. Decl. Dec. 8, 1955. 18p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40 (mf OTS).

A calutron unit was operated at magnetic fields between 5000 and 15,000 oersteds. The effect of the field on a number of calutron parameters and performance characteristics was observed for a variety of charge materials. In particular, arc stability and calutron production efficiencies increased with increased magnetic fields, whereas total ion production and optimum slot widths decreased. (auth)

3633 Y-655

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
AN INDIRECTLY HEATED CATHODE FOR THE CALUTRON ION SOURCE. John J. Murphy and Raymond Murray. Dec. 15, 1948. Decl. Dec. 6, 1955. 11p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An indirectly heated cathode for use in the calutron ion source has been successfully developed. Both Ta and W serve well as cathodes, and each has been tested with several charge materials. With a method of replacing cathodes during operation, extremely long runs may be possible, as filament life is no longer a problem. (auth)

Refer also to abstract 3568.

MASS SPECTROGRAPHY

3634 AECD-3787

Tennessee Eastman Corp., Oak Ridge, Tenn.
DIAGNOSIS OF INSTABILITY OF AN ASSAY MASS SPECTROMETER. A. E. Cameron and G. P. Happ. Mar. 6, 1946. Decl. Nov. 28, 1955. 9p. Contract [W-7401-eng-23]. (B-6.460.11). $1.80(ph OTS); $1.80(mf OTS).

The type of trouble most frequently encountered in maintaining an assay mass spectrometer falls into the general classification of instability. A systematic procedure for locating the causes of instability is offered. (D.E.B.)

3635 KLX-1384

Vitro Corp. of America, New York.
PROJECT STATUS REPORT MASS SPECTROMETER DEVELOPMENT. Job 24-B2. P. A. Stowell. Dec. 30, 1952. Decl. Dec. 12, 1955. 22p. Contract AT(30-1)-850. $4.80(ph OTS); $2.70(mf OTS).

The program of modifying a commercial isotope ratio mass spectrometer to adapt it to rapid analysis of solid materials has been continued. Modification and improvements have resulted in an instrument which has successfully demonstrated rapid isotopic analyses of a variety of solid materials. (auth)

MATHEMATICS

3636   CP-2541
[Chicago. Univ. Metallurgical Lab.]
ON THE STATISTICS OF ROD WARPING. A. V. Martin
and G. Young. Dec. 28, 1944. Decl. Dec. 13, 1955. 19p.
Contract W-7401-eng-37. $3.30(ph OTS); $2.40(mf OTS).

The probability of exceeding assigned values of dis-
placements or forces in simple rod models assembled
from slugs picked at random is discussed, and some
estimate for the statistical gain resulting from the use of
shorter slugs is obtained. The probability that a rod
with self-warping will touch the top of the tube appears
great enough to justify a recommendation of the use of
top ribs. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

3637   HW-27090
Hanford Works, Richland, Wash.
A METHOD FOR THE ANALYSIS OF RADIONUCLIDE
MIXTURES USING A GAMMA-BETA SCINTILLATION
SPECTROMETER. M. B. Leboeuf and R. E. Connally.
Feb. 27, 1953. Decl. Dec. 7, 1955. 37p. Contract W-31-
109-eng-52. $6.30(ph OTS); $3.00(mf OTS).

Beta and gamma scintillation detectors have been de-
signed for use with an automatic recording, energy
spectrometer. The application of this instrument to the
analysis of mixtures of radionuclides which decay by
gamma emission has been investigated. Integration of the
area under the photoelectric peak of a differential pulse
height scan obtained with the gamma energy spectrometer
permits quantitative determination of each gamma emitter
present. The substances present in three component,
mixtures have been identified, and, using the photopeak
area method, the compositions of the mixtures have been
determined with a precision of $\pm 2.6\%$ (Std. Dev.) of the total
gamma activity. A simplified method for the quantitative
interpretation of scans is given, and its use for the deter-
mination of fission products in Redox and Metal Recovery
plant streams is explained. Scans obtained on individual
fission products and on a variety of such process samples
are shown, and these illustrate the simplicity and wide
range of applicability of the method. Analyses of solutions
containing mixed gamma emitters were performed directly,
without preliminary separations, in less than 40 minutes.
It is believed that this instrumental method for the analysis
of radionuclide mixtures will be of particular value to
radiochemical process control because of its speed and
reliability; in addition, it is expected to find application in
any studies where mixed gamma emitters are used. (auth)

3638   K-497
Carbide and Carbon Chemicals Corp. K-25 Plant,
  Oak Ridge, Tenn.
PROPORTIONAL FISSION NEUTRON COUNTERS. R. C.
Rohr, E. R. Rohrer, and R. L. Macklin. Aug. 1, 1949.
Decl. Dec. 27, 1955. 10p. Contract [W-7405-eng-26].
(KLO-143). $1.80(ph OTS); $1.80(mf OTS).

Some proportional fission neutron counters are de-
scribed with information on methods of preparation and
details of a circuit for a portable model. The portable
instrument has an efficiency of .01% for neutrons from
Po-Be sources. (auth)

3639   K-757
Carbide and Carbon Chemicals Co. K-25 Plant,
  Oak Ridge, Tenn.
PRELIMINARY REPORT ON A HIGH SENSITIVITY GAMMA
PROBE FOR USE WITH THE SAMSON SURVEY METER.
R. W. Schede. May 1, 1951. Decl. Dec. 27, 1955. 14p.
Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A high sensitivity gamma extension probe has been de-
veloped for use with the Samson survey meter. It has a
sensitivity of 0.02 mr/hr full scale. The probe weighs 4.5
lb. and is 19 in. long by 2.5 in. in diameter. The primary
function of this probe is to locate deposits of U^{235} in
process equipment. (auth)

3640   RL-4.6.271
[California. Univ., Berkeley. Radiation Lab.]
THE TECHNIQUE OF 27 MEASUREMENT. M. B. Allen.
July 17, 1944. Decl. Dec. 7, 1955. 5p. $1.80(ph OTS);
$1.80(mf OTS).

Problems arising in the accurate measurement of the
U^{237} β radiation are considered in connection with the use
of this isotope as a tracer. Preparation of samples with
low self-absorption is outlined, as well as factors affected
by the build-up of decay products. A satisfactory pro-
cedure is outlined for getting the U^{237} into solution,
evaporating the solution on fine-grained filter paper, and
counting with a thin-window bell jar counter. (K.S.)

MOLECULAR PROPERTIES

3641   MonT-164
[Clinton Labs., Oak Ridge, Tenn.]
THERMAL CONDUCTIVITIES OF PRESSED POWDERS.
Final Report. B. Manowitz. Sept. 5, 1946. Decl. Nov.
28, 1955. 15p. Contract W-35-058-eng-71. $3.30(ph
OTS); $2.40(mf OTS).

The thermal conductivities of lucite, $Ca(NO_3)_2$, MgO,
and Be_3N_2 at 80°C have been measured. (C.W.H.)

NEUTRONS

3642   AECD-3848
California Research and Development Co., Livermore,
  Calif.
FUNDAMENTAL EQUATIONS DESCRIBING NEUTRON
BEHAVIOR IN A CAVITY. D. B. Willmer and D. H. Imhoff.
May 22, 1951. Decl. Dec. 5, 1955. 6p. (CRD-T4A-18).
$1.80(ph OTS); $1.80(mf OTS).

3643   AECD 3849
California Research and Development Co., Livermore, Calif.
ANGULAR DISTRIBUTION OF NEUTRONS FROM A
PLANE SURFACE. W. H. Harker. May 24, 1951. Decl.
Dec. 5, 1955. 8p. (CRD-T4A-23; LWS-23014). $1.80
(ph OTS); $1.80(mf OTS).

In connection with the problem of neutron losses in
reactor matrices, a theoretical determination is made of
the angular distribution of the neutrons emitted from the
interior faces of the lattice and the exterior faces of the
target. The problem is investigated by considering the
dimensions of the faces to be large compared to the total
mean free path. (B.J.H.)

3644   ANL-4475
Argonne National Lab., Lemont, Ill.
ESTIMATION OF NEUTRON SELF ABSORPTION IN RaCO₃

SAMPLES. Robert Keyes. June 26, 1950. Decl. Jan. 5, 1956. 11p. Contract W-31-109-eng-38. $1.80(ph OTS); $1.80(mf OTS).

Approximate solutions of neutron self absorption for spherically and cylindrically symmetric geometries are obtained and evaluated numerically for the case of $RaCO_3$ surrounded by Be. The results are given in both tabular and graphical form. (B.J.H.)

3645   CF-52-2-55
Oak Ridge National Lab., Tenn.
NEUTRON SPECTRUM AND DOSE BUILDUP FACTOR IN WATER. H. P. Sleeper. Feb. 7, 1952. Decl. Dec. 15, 1955. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations of the neutron dose buildup factor in H_2O had previously been made assuming an energy-independent O removal cross section. The spectrum and buildup factor for fission neutrons in H_2O were also determined using an accurate cross section and angular dependence for H, and a smoothed-out O cross section, averaged over the narrow resonances and extrapolated to high energies by theory. The buildup factors obtained by the two methods are compared graphically as a function of distance from the source. Results show the neutron buildup factor calculated by the latter method to be about three times that calculated by the former. (B.J.H.)

3646   CF-863
Chicago. Univ. Metallurgical Lab.
ACTIVATION OF FAST NEUTRON DETECTORS BY CYCLOTRON AND BY FISSION NEUTRONS. J. Ashkin and B. Feld. Apr. 1, 1943. Decl. Dec. 13, 1955. 6p. $1.80(ph OTS); $1.80(mf OTS).

The (n,α), (n,p) and (n,γ) reactions in Al, P and I have been studied as fast neutron detectors, by investigating their activation in a pile of U metal. The cyclotron was used as a source of fast neutrons. Two categories of neutrons were considered: "fast," or those capable of exciting (n,α) and (n,p) reactions, and "slow," or those exciting (n,γ) activities. The relative activations of these reactions were studied in different parts of the pile. For "fission" neutrons, the ratio of activities was found to be: $Al(n,\alpha)/Al(n,p) \simeq 0.4$; $Al(n,p)/P(n,p) \simeq 0.2$; $I(n,\gamma)/Al(n,\alpha) \simeq 7$. These results suggest a method of comparing the fission spectrum with the energy spectrum of other sources by comparing activations of fast neutron detectors. Information on the way in which cyclotron neutrons come into equilibrium in the metal is gained by considering the variation in relative activation for different positions in the pile. Experimental "slow" to "fast" ratios are directly compared with the capture-to-fission ratios observed earlier. It is shown that the $P(n,\gamma)/P(n,p)$ ratio behaves in somewhat the same fashion as uranium capture/fission. (auth)

3647   CP-597
Chicago. Univ. Metallurgical Lab.
EFFECT OF TEMPERATURE ON THE RESONANCE ABSORPTION OF NEUTRONS BY URANIUM. Allan C. G. Mitchell, Louis Slotin, John Marshall, V. A. Nedzel, L. J. Brown, and John R. Pruett. Apr. 22, 1943. Decl. Dec. 14, 1955. 19p. Contract [W-7401-eng-37]. $3.30 (ph OTS); $2.40(mf OTS).

The resonance absorption of uranium for neutrons has been investigated between 20 and 1000°C. Experiments

were carried out on both UO_2, density 4.63, and metal. The resonance activity was measured with respect to that of an iodine monitor at several different temperatures and the ratio of activity at temperature T to that at 20°C was determined. The increase in activity is 0.9% per 100°C for the oxide and 1.1% per 100°C for the metal. (auth)

3648   LAMS-121
[Los Alamos Scientific Lab., N. Mex.]
NEUTRON EMISSION BY POLONIUM OXIDE LAYERS. M. Argo and E. Teller. Aug. 8, 1944. Decl. Dec. 13, 1955. 7p. Contract [W-7405-eng-36]. $1.80(ph OTS); $1.80(mf OTS).

The number of neutrons produced by the $O^{16}(\alpha,n)$ reaction in a thin and uniform polonium oxide layer is calculated. Factors due to oblique transmission and "effective" α-particle range have been taken into account. Calculations for layer thicknesses between $.01c/cm^2$ and $1c/cm^2$ indicate the number of neutrons emitted per curie of polonium alpha particles is approximately given by $140 \times C^{0.8}$ where C is the number of curies per square centimeter. (auth)

Refer also to abstracts 3725 and 3748.

NUCLEAR PHYSICS

3649   AECD-3846
Argonne National Lab., Lemont, Ill.
PHYSICS DIVISION QUARTERLY REPORT FOR APRIL, MAY AND JUNE 1950. A. Wattenberg, F. C. Hoyt, and Louis A. Turner, eds. July 5, 1950. Decl. with deletions Dec. 12, 1955. 110p. Contract W-31-109-eng-38. $16.80(ph OTS); $5.70(mf OTS).

3650   ANL-4076
Argonne National Lab., Lemont, Ill.
EXPERIMENTAL NUCLEAR PHYSICS DIVISION AND THEORETICAL NUCLEAR PHYSICS DIVISION REPORT FOR JULY, AUGUST AND SEPTEMBER. Oct. 13, 1947. Decl. Dec. 15, 1955. 105p. Contract W-31-109-eng-38. $16.80(ph OTS); $5.70(mf OTS).

3651   ANL-4174
Argonne National Lab., Lemont, Ill.
EXPERIMENTAL NUCLEAR PHYSICS DIVISION REPORT FOR APRIL, MAY AND JUNE. July 6, 1948. Decl. Dec. 15, 1955. 74p. Contract W-31-109-eng-38. $12.30(ph OTS); $4.50(mf OTS).

Half life and energy measurements for $Hg^{203,205}$ β activity were made. The γ spectrum of Au^{198} was investigated and the results compared with previous findings. Yields of delayed neutrons from Pu fission were found to be independent of incident neutron energy. The low capture cross section for isotopes having 82 neutrons is explained on the basis of filled nuclear shells. Empirical data for the standard pile are given. Techniques and results of small angle neutron scattering measurements on crystalline substances are given. Circuitry for a new pile oscillator system is presneted and its operation explained. Results of neutron absorption cross section measurements on C, Mg, Al, and La are summarized. Progress is reported on γ-ray cross-over transitions, neutron diffraction in liquids, and absolute thermal neutron flux measurements. Investigations of internal conversion in Br radiative capture are discussed. The existence of the 5.5-second W activity was verified. (D.E.B.)

3652   ANL-4208

Argonne National Lab., Lemont, Ill.

EXPERIMENTAL NUCLEAR PHYSICS DIVISION REPORT
FOR JULY, AUGUST AND SEPTEMBER; THEORETICAL
NUCLEAR PHYSICS DIVISION SUMMARY REPORT FOR
APRIL THROUGH SEPTEMBER. Oct. 4, 1948. Decl. Dec.
14, 1955. 105p. Contract W-31-109-eng-38. $16.80(ph
OTS); $5.70(mf OTS).

An end point of 570 ± 10 kev and a half life of 2.7 ±
0.4×10^6 years was established for Be^{10}. Differences in
Be^{10} and C^{10} decay are explained on the basis of a C^{10}
decay to an excited state of B^{10}. A technique for making
thin nylon film is given. Theoretical and experimental
considerations of small-angle neutron scattering are
reviewed. Results indicate that the hypothesis that
scattering is caused by multiple refraction at domain
boundaries is adequate, and may be useful in domain struc-
ture investigations. A single crystal of Pb was used in
plotting the effect of crystal structure on neutron cross
sections. Results of small-angle neutron scattering
measurements indicate a definite correlation between
particle size and scattering at low energies. The neutron
scattering cross section for Co was determined using
pile, epi-Cd, and sub-Cd neutrons. Studies in coincidence
measurements, cross over transitions in Br^{82}, Sb^{124}, Co^{60},
Mn^{56}, Cl^{38}; and internal conversions in Br were continued.
A 29-sec activity for Pt and 5 and 40 sec. activities for Yb
are reported. Eighteen isotopes are added to the list having
no short life activities. The 19 sec. isomeric transition in
Hf is shown as a means of determining the presence of this
impurity in Zr. Statistical studies of the Monte Carlo
procedure are reported. Expressions for the paramagnetic
effects in neutron polarization in Fe are given, and methods
for neutron polarization are reviewed. (D.E.B.)

3653   ANL-4277

Argonne National Lab., Lemont, Ill.

EXPERIMENTAL NUCLEAR PHYSICS DIVISION REPORT
FOR JANUARY, FEBRUARY AND MARCH 1949. Apr. 4,
1949, Decl. Dec. 13, 1955. 82p. Contract W-31-109-
eng-38. $13.80(ph OTS); $4.80(mf OTS).

The two indices of refraction for neutrons in iron were
shown experimentally. These were in agreement with
theoretical predictions. Tests of the Mayer theory of
closed neutron shells were continued to 48- and 50-
neutron nuclei. The design and operating characteristics
of a fast neutron chopper are given. The β spectra of Tl^{204}
and Tb^{160} are discussed. The Br recoil energy spectrum
was plotted as a function of applied voltage. Measure-
ments by the soap film technique will be made for com-
parison. The method of neutron activation analysis of
meteorites is outlined and results of analyses for Au and
Rh are reported. A neutron velocity selector design is
described. A table of total neutron cross sections prepared
from Co and Mn resonance scattering analysis is pre-
sented. Results of neutron absorption cross section
measurements for 46 elements are reported. Equations
for the relationship of the epi-Cd scattering cross section
and the resonance scattering integral are given, and com-
puted resonance integrals tabulated. The technique and
results of a Cd capture γ-ray spectrum study with photo-
graphic plates are discussed. Results of D_2O slow neutron
diffraction experiments are given, and the angular dis-
tribution of Be photoneutrons are plotted. (D.E.B.)

3654   ANL-4323

Argonne National Lab., Lemont, Ill.

EXPERIMENTAL NUCLEAR PHYSICS DIVISION AND
THEORETICAL NUCLEAR PHYSICS DIVISION REPORT
FOR APRIL, MAY AND JUNE 1949. July 5, 1949. Decl.
Dec. 14, 1955. 71p. Contract W-31-109-eng-38.
$10.80(ph OTS); $3.90(mf OTS).

The study of neutron polarization by reflection from
magnetized mirrors was continued. Properties of Co which
led to its substitution for Fe as the reflecting surface are
discussed. The reaction $e^- + H^1 \rightarrow n + \nu$ was employed in
an attempt to estimate the contribution of neutrinos to the
earth's heat. Results indicate a maximum of 4% of the
earth's heat can be attributed to the sun's neutrinos.
Chemical dissociation of compounds containing nuclei
undergoing isomeric transition was investigated. The
transition of 4.4-hour Br^{80} to -18 min Br^{80} in ethyl bromide
is specifically treated. U^{238} effective neutron resonance
integrals were found to be linear with the ratio of surface
area to mass in normal U metal rods. Values of "a" and
"b" in $\Sigma = a + b \, s/m$ were 9.25 and 24.7 where Σ is the
effective absorption integral, S the surface area (cm^2), and
m the mass (gm.). Results of neutron absorption cross
section measurements on Na and Cr by Co and Mn detec-
tion are given. The method and results of neutron res-
onance width measurements on Co^{60}, Mn^{56}, and W^{187} are
discussed. Additional Cd-ratio measurements of activa-
tion integrals were made in the rabbit flux of CP-3. The
data obtained from 26 isotopes are listed. Photographic
plate studies of neutron capture gamma spectra were ex-
tended to Cl; results are graphed. Results of coincidence
measurements with Hf^{181} are reviewed. The fast group
equation for a two-group model is derived assuming that
diffusion theory holds for neutrons of all energies. The
integral equation for monochromatic neutron scattering is
developed for machine evaluation. Laplace transforms
are used to derive exact expressions for the Doppler effect
when the capture cross section follows a Breit-Wigner
one level formula, and in the case of several resonances.
The cross section for self-indication is also evaluated.
Isotope shifts in the He atomic spectrum are calculated.
(D.E.B.)

3655   ANL-4350

Argonne National Lab., Lemont, Ill.

EXPERIMENTAL NUCLEAR PHYSICS DIVISION AND
THEORETICAL NUCLEAR PHYSICS DIVISION. Quarterly
Report [for] July, August, and September 1949. Oct. 10,
1949. Decl. Dec. 10, 1955. 97p. Contract W-31-109-
eng-38. $15.30(ph OTS); $5.40(mf OTS).

Neutron cross sections for various elements at 115 and
300 ev are listed. A more thorough investigation was made
of neutron resonances in Na, Cr, and V. Equations are given
for resonance absorption using flat and resonance scattering
detectors. Recently obtained Cd-ratio measurements are
summarized. Resonance scattering data for inert gases
and rare earths are also given. Preliminary results of the
operation of the Van de Graaff are discussed. Work on the
fast chopper is also reported. The neutron capture γ ray
spectra of Fe and Al are shown. Data on the angular distri-
bution of photoneutrons from deuterium at 2.76 Mev are
given. A determination was made of slow and fast fluxes in-
side a U annulus bombarded by pile neutrons. Work was
continued on the reflection of neutrons from ferromagnetic

mirrors. Neutron scattering curves for soda—lime—silica glass and fused quartz are given. The change in reactivity of the Argonne Heavy Water Reactor caused by placing various sizes of natural U inside a central Cd-covered thimble is reported. A general discussion is given on the nuclear shell model based on jj coupling, including discussions of spins, magnetic moments, excited states, β decay, and the magnitude of the spin-orbit coupling. Progress is reported on the solution of reactor problems by numerical methods. (B.J.H.)

3656   ANL-4437
Argonne National Lab., Lemont, Ill.
EXPERIMENTAL NUCLEAR PHYSICS DIVISION AND THEORETICAL NUCLEAR PHYSICS DIVISION REPORT FOR JANUARY, FEBRUARY AND MARCH 1950. A. Wattenberg and W. H. McCorkle, eds. Apr. 5, 1950. Decl. Dec. 13, 1955. 130p. Contract W-31-109-eng-38. $19.80(ph OTS); $6.30(mf OTS).

Neutron cross sections of Ru, Pd, and La^{139} at 120 ev and 345 ev are reported. Evidence for the existence of a negative energy neutron resonance in Cl^{35} is discussed. Measurements were made of the number of γ rays emitted in a neutron capture process for various nuclei and the dependence of this number on atomic number is discussed. Neutron scattering cross sections of the noble gases were measured. Measurements were made of the β radiation from Ho^{166}, Er^{171}, and In^{116}, and the results are summarized. Total neutron cross sections of Co and Mn are given. Designs are given for the target assembly to be used for determining photodisintegration thresholds, and the (γ,n) thresholds of deuterium and Be are reported. Designs of a neutron beam collimator are also given. Coherent n-p scattering is discussed. Neutron capture γ-ray spectra for W and Hg are given, and these results are discussed. The neutron groups from the reaction Li^7 (p,n) Be^7 were studied. An experimental determination was made of the neutron flux depression in the neighborhood of a foil inside a standard graphite pile. Neutron activation cross sections are reported for various substances. Total neutron cross sections of tungsten isotopes are given. Circuit designs for a low noise preamplifier are given. The β spectrum of Hf^{181} was investigated. Experiments on the conversion coefficients of 4.4-hr Br^{80m} in isomeric transitions are described. The determination of charged 17-min Rb^{88} ions resulting from the β-decay of 3-hr Kr^{88} is discussed. The feasibility of neutron fuses for a nuclear reactor is studied. The numerical determination of fundamental modes is discussed in detail. The theory of spin-spin doublets in N^{15} and O^{16} is also discussed. A three-group method for obtaining the critical properties of heavy-water moderated reactors is also given. (B.J.H.)

3657   ANL-4602
Argonne National Lab., Lemont, Ill.
PHYSICS DIVISION REPORT FOR DECEMBER 1950, JANUARY AND FEBRUARY 1951. Mar. 5, 1951. Decl. Dec. 10, 1955. 62p. Contract W-31-109-eng-38. $10.80 (ph OTS); $3.90(mf OTS).

Neutron cross sections for various elements are tabulated. Data are given on the internal conversion of capture γ rays in Gd and Sm. Improvements are described for the CP-3 pile oscillator circuit. The coherent neutron scattering cross section of Hg was measured. Results of a study of the internal conversion electron spectra of Se and Sm isotopes are tabulated. Improvements made on the Van de

Graaff accelerator are discussed. The isomeric transition of Br^{80} is also discussed. A procedure is described for the preparation of metallic Na^{24} after pile irradiation of aluminum nitrate. Studies were made on the organic retention of I following radiative neutron capture. The condensation of Na^{24} molecular beams on various metals was studied. Techniques are outlined for the determination of atmospheric krypton content. Preliminary results of x-ray studies of Zr fluorides are reported. A mathematical analysis was made of the field of the lens system of the linear accelerator. Axial asymmetry in the linear accelerator is also discussed. (B.J.H.)

3658   CP-1729
Chicago. Univ. Metallurgical Lab.
NUCLEAR PHYSICS DIVISION REPORT FOR MONTH ENDING MAY 25, 1944. PART I. June 2, 1944. Decl. Dec. 15, 1955. 49p. (A-2443). $7.80(ph OTS); $3.30 (mf OTS).

3659   CP-2568
[Clinton Labs., Oak Ridge, Tenn.]
PHYSICS SECTION MONTHLY REPORT FOR THE PERIOD ENDING JANUARY 31, 1945. Feb. 1, 1945. Decl. Dec. 14, 1955. 31p. Contract W-7405-eng-39. $6.30(ph OTS); $3.00(mf OTS).

3660   LWS-12019
California Research and Development Co., Livermore, Calif.
CROSS SECTIONS FOR THE FORMATION OF Na^{22} FROM ALUMINUM BOMBARDED WITH PROTONS (0 TO 32.5 MEV). R. E. Batzel. July 18, 1951. Decl. Dec. 6, 1955. 5p. Contract AT(11-1)-74. $1.80(ph OTS); $1.80(mf OTS).

The variation of the cross section for the formation of Na^{22} from Al with the energy of the bombarding proton was determined from 32.5 to 25 Mev, the apparent threshold of the reaction. Results are given in graphical form. (B.J.H.)

3661   MonP-356
Clinton Labs., Oak Ridge, Tenn.
FISSION RECOILS IN A VARIABLE DENSITY BODY. G. Young. Aug. 6, 1947. Decl. Dec. 9, 1955. 13p. Contract W-35-058-eng-71. $3.30(ph OTS); $2.40 (mf OTS).

Calculations are made for the distribution of heat production in a fissioning slab of variable density, and for the escape of recoil particles and energy from the slab. A result is also given for the heat production in the inner part of a not-too-small fissioning body of any shape. (auth)

3662   RL-28.5.117
[California. Univ., Berkeley. Radiation Lab.]
SUMMARY OF THE RESEARCH PROGRESS MEETING. R. K. Wakerling. Aug. 1, 1946. Decl. Nov. 28, 1955. 6p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Preliminary tests of the r-f system for the 184-in. cyclotron were made on a $\frac{1}{4}$-scale model. The status of proton—proton scattering experiments at 15 Mev were reviewed. (B.J.H.)

3663   UCRL-116
California. Univ., Berkeley. Radiation Lab.
PHYSICS DIVISION QUARTERLY REPORT [FOR] FEBRUARY 1, 1948 TO MAY 1, 1948. June 30, 1948. Decl. Nov. 28, 1955. 78p. Contract W-7405-eng-48. $12.30(ph OTS); $4.50(mf OTS).

A determination was made of the angular distribution of

the protons scattered when 90-Mev neutrons impinge on a H-filled cloud chamber. Methods for the detection of mesons are discussed. Meson tracks initiating stars are shown. Mass distributions of mesons were found from ranges in emulsion. The status of n-p scattering calculations is reviewed. The cross section for the production of mesons by α particles is also calculated. Measurements of the total n-p cross section, made at 90 and 38 Mev, are summarized. Designs are given for a refrigerated photomultiplier unit used for the investigation of the characteristics of the scintillation counter. Voltage-gain characteristics of the 1P21 photomultiplier are included. The arrangement of a complete "counting unit" using anthracene scintillation counters is shown. Operation and development of the 184- and 60-in. cyclotrons are discussed. Operation of the synchrotron is briefly discussed. (B.J.H.)

3664   UCRL-130
California. Univ., Berkeley. Radiation Lab.
RESEARCH PROGRESS MEETING, JUNE 3, 1948.
Margaret Foss Folden. Decl. Nov. 28, 1953. 8p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Evidence for the existence of the heavy meson is discussed. Improvements in the background of the 184-inch cyclotron are also described. (B.J.H.)

NUCLEAR PROPERTIES

3665   AECD-3994
Carbide and Carbon Chemicals Co., Y-12 Area, Oak Ridge, Tenn.
THE TEMPERATURE DEPENDENCE OF A CROSS-SECTION EXHIBITING A RESONANCE. R. K. Osborn. Nov. 17, 1952. Decl. Jan. 6, 1956. 5p. Contract W-7405-eng-26. (Y-F10-112). $1.80(ph OTS); $1.80(mf OTS).

The explicit energy and temperature dependence of a macroscopic cross section exhibiting a resonance is calculated, assuming a particular form for the microscopic cross section and that particles in the absorbing system are in a Maxwell-Boltzmann velocity distribution. (B.J.H.)

3666   CF-54-2-159
Oak Ridge National Lab., Tenn.
NUCLEAR CONSTANTS FOR Pu^{239} AT 250°C AND 300°C. P. N. Haubenreich. Feb. 16, 1954. Decl. Dec. 6, 1955. 8p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Information from BNL-170, BNL-170B, and BNL-221 were used to evaluate the nuclear constants for Pu^{239} at 250 and 300°C. Data are tabulated. (C.H.)

3667   LA-266
[Los Alamos Scientific Lab., N. Mex.]
ABSORPTION AND FISSION CROSS SECTIONS OF 49 [Pu^{239}] IN THE NEUTRON ENERGY RANGE 0.01 ev TO 100 ev. E. E. Anderson, B. D. McDaniel, R. B. Sutton, and L. S. Lavatelli. Apr. 23, 1945. Decl. Dec. 14, 1955. 20p. Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

Measurements have been made of the variation of the fission cross section of Pu^{239}, σ_f with neutron energy for the region from 0.02 ev to 450 ev and of the variation of the absorption cross section, σ_a, in the region 0.01 ev to 50 ev. Neutron energies were determined by use of the slow-neutron velocity spectrometer. The fission and absorption cross section curves appear qualitatively to be quite similar. Three resonances were observed. One,

which has been previously reported is at 0.295 ev, a second at about 12 ev and a third at about 60 ev. The first two were observed both in fission and absorption, the third in fission only since the absorption data do not extend to high enough energy. The quantity $1 + \alpha = \sigma_a / \sigma_f$ in the region between 0.0250 ev and 1 ev was computed from the measurements. It deviates from its value at 0.0250 ev by an amount between one and two times the estimated probable value. Since the estimation of the probable error is rather difficult it is not possible to say whether α does or does not vary in this region. It was found impossible to fit the resonance at 0.295 ev with a Breit-Wigner one-level formula. The possible significance of this fact and of the behavior of $1 + \alpha$ is discussed. (auth)

3668   M-2273
Columbia Univ., New York.
NEUTRON BEAM SPECTROMETER STUDIES OF NITROGEN. E. Melkonian, W. W. Havens, Jr., L. J. Rainwater. Aug. 8, 1947. Decl. Nov. 28, 1955. 7p. Contract AT-30-1-Gen-72. (DR-971). $1.80(ph OTS); $1.80(mf OTS).

Neutron cross sections for nitrogen at energies greater than 0.025 ev were estimated to be $9.60 + 0.48 E^{-\frac{1}{2}}$ barns. The capture cross section for thermal neutrons is calculated to be 3.04 barns. (C.W.H.)

3669   M-2554
Columbia Univ., New York.
NEUTRON BEAM SPECTROMETER STUDIES OF OXYGEN. E. Melkonian, L. J. Rainwater, and W. W. Havens, Jr. Aug. 8, 1947. Decl. Nov. 28, 1955. 7p. Contract AT-30-1-GEN-72. (DR-972) $1.80(ph OTS); $1.80(mf OTS).

Neutron cross sections of oxygen at 0.04 ev and in the energy region, 10 to 100 ev were measured to be 4.1 and 3.68 barns, respectively. No resonance levels were found in the regions studied. (C.W.H.)

3670   M-2555
Columbia Univ., New York.
NEUTRON BEAM SPECTROMETER STUDIES OF ARGON. E. Melkonian, W. W. Havens, Jr., and L. J. Rainwater. Aug. 8, 1947. Decl. Nov. 28, 1955. 7p. Contract AT-30-1-GEN-72. (DR-973) $1.80(ph OTS); $1.80(mf OTS).

Neutron cross sections for argon at 0.04 ev were measured to be 1.25 barns. The capture cross section for thermal neutrons is estimated to be 0.78 barn. (C.W.H.)

3671   M-4576
Monsanto Chemical Co., Dayton, Ohio.
CALCULATIONS OF FUNDAMENTAL CONSTANTS AND CONVERSION FACTORS. 1947 VALUES. (Supplement to Information Report No. 37). R. A. Staniforth. Jan. 5, 1948. Decl. Dec. 8, 1955. 20p. $3.30(ph OTS); $2.40 (mf OTS).

Included are calculations of the packing fractions of Pb^{206} and Po^{210}, the rest masses of Pb^{206} and the recoil fragments from Po disintegration, the energies of Po α particles and the recoil fragments of Po disintegration, the gram atomic weights of Po^{210} and Pb^{206}. Conversion factors for units used in radioactivity are listed. (B.J.H.)

NUCLEAR REACTORS

3672   AECD-3862
North American Aviation, Inc., Los Angeles.
IMPREGNATION OF BERYLLIUM OXIDE WITH URANIUM. M. C. Sanz and R. Randolph. Aug. 20, 1947. Decl. Dec. 5.

1955. 18p. (NAA-AL-228). $3.30(ph OTS); $2.40(mf OTS).

A method of impregnating porous beryllium oxide uniformly with UO_3 has been developed. Physical and ceramic properties of beryllium oxide are tabulated. (C.W.H.)

3673 AECD-3869
Clinton Labs., Oak Ridge, Tenn.
CHEMICAL STABILITY OF HIGH TEMPERATURE POWER PILE. S. L. Simon and J. V. Fitzgerald. Feb. 4, 1947. Decl. Dec. 7, 1955. 16p. Contract [W-7405-eng-39]. (CL-SLS-1). $3.30(ph OTS); $2.40(mf OTS).

Free energies, heats and entropies of formation, vapor pressures, and melting points of compounds of U, Th, Nb, Fe, and C, and free energies at 1500°K of chemical reactions involving reactor constituents are tabulated. The possible chemical reactions in a sample reactor are discussed. (C.W.H.)

3674 AECD-3931
Oak Ridge National Lab., Tenn.
ENERGY PER FISSION AND POWER OF THE BULK SHIELDING REACTOR. J. L. Meem, E. B. Johnson, and H. E. Hungerford. May 12, 1953. Decl. with deletions Dec. 22, 1955. 9p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

The energy per fission in the BSR was re-measured and the new value is given. Using this result and the recalibration results of the ORNL Graphite Reactor, the absolute power may be determined within a few percent. A list of reports in which data should be corrected is given. (D.E.B.)

3675 AECD-3971
Oak Ridge National Lab., Tenn.
SCALE-UP OF ALTERNATE HRT CORE. L. B. Lesem and P. H. Harley. May 7, 1954. Decl. with deletions Jan. 3, 1956. 6p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

In order to determine the factors involved in the scale-up of cores, several models were assembled and tested. Visual studies were made of dye and gas behavior in the sphere of the core, and the static pressure drop across the core was measured. (B.J.H.)

3676 AECD-3989
Oak Ridge National Lab., Tenn.
MEASUREMENTS OF A B_4C AND H_2O SHIELD IN THE LID TANK — EXPERIMENT II. E. P. Blizard and C. E. Clifford. Dec. 15, 1950. Decl with deletions Nov. 30, 1955. 19p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40 (mf OTS).

The attenuation of neutrons and γ rays in solid B_4C of various thicknesses followed by H_2O containing 0.5% B by weight was measured in the Lid Tank. Complete results are given in both graphical and tabular form. (B.J.H.)

3677 ANL-4428
Argonne National Lab., Lemont, Ill.
REACTOR ENGINEERING DIVISION QUARTERLY REPORT [FOR] DECEMBER 1, 1949 THROUGH FEBRUARY 28, 1950. W. P. Bigler. Mar. 17, 1950. Decl. Dec. 13, 1955. 25p. Contract W-31-109-eng-38. $4.80(ph OTS); $2.70(mf OTS).

Operation of the Argonne Heavy Water Reactor is summarized. Design characteristics of the Argonne Research Reactor are discussed. Diagrams are given of the reactor and of the apparatus for stopping the reactor.

Data on the effects of irradiation on the tensile strength and hardness of nickel bars are tabulated. (B.J.H.)

3678 ANL-4487
Argonne National Lab., Lemont, Ill.
THE CALCULATION OF INDUCED GAMMA ACTIVITY IN COMMERCIAL MATERIALS. Paul J. Persiani. Aug. 8, 1950. Decl. Dec. 14, 1955. 34p. Contract W-31-109-eng-38. $6.30(ph OTS); $3.00(mf OTS).

In many materials it is possible to effect a considerable reduction in pile-induced gamma activity by decreasing the content of one or more impurity. However, there are many factors to consider before setting up preliminary specifications. Some of these factors are the period of irradiation required, the time after irradiation at which the material is to be handled, and the feasibility of decreasing the amount of an impurity. Gamma activity data are presented for some commercial materials that may be used in the Materials Testing Reactor. A summation of the activities of the more significant elements present in each material is made on a log-log plot. The plots serve to indicate the contribution of the "impurities" to the total activity of a material at a particular time of decay. (auth)

3679 BNL-2393
Brookhaven National Lab., Upton, N. Y.
LIQUID FUEL REACTORS. (Reprint of Project Dynamo Report PD-32). J. Chernick. Aug. 25, 1953. Decl. Dec 12, 1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

The results of liquid fuel reactor studies are reported. The two reactor concepts most intensively studied are: a reactor core consisting of a solution of U^{233} in Bi, Be or graphite rods as moderator, and a blanket of ThF_4 pellets; and a graphite structure with $U-Pb-Sn$ slurry fuel separated from the Th_3Bi_5 slurry coolant. Some problems of liquid fuel reactors are discussed, including the $U^{233}-$ Th breeding cycle, the container problem, location of moderator rods, delayed neutron losses, and core geometry. (M.P.G.)

3680 C-192
[Chicago. Univ. Metallurgical Lab.]
SOME PHYSICAL CONSTANTS IMPORTANT IN THE DESIGN OF AN ATOMIC POWER PLANT. T. M. Snyder and R. L. Kamm. [nd]. Decl. Dec. 12, 1955. 56p. Contract [W-7401-eng-37]. (A-230). $9.30(ph OTS); $3.60(mf OTS).

The determination of a number of physical constants, primarily those connected with the heat transfer in an atomic power plant has been carried out. The thermal conductivity of a number of U materials was investigated in order to determine from which the large amounts of heat generated could be most easily extracted. Uranium itself and its sintered carbide proved most promising with conductivities of .045 and .08 cal/cm sec deg respectively. The electrical conductivity of the metal was also measured and found to give a good Wiedemann Franz ratio using this value of the thermal conductivity. In the present design of a power plant, graphite would be used as a neutron damper and perhaps in construction of cooling fins or ducts. The conductivity is found to be .28 near room temperature for most samples and to decrease with increasing temperature. In addition the thermal conductivities of other materials of possible use in design of such a plant were determined. Experiments on thermal transfer coefficients between two conductors showed that they depend almost entirely on the type of contract established between the two materials.

The thermal coefficient of expansion, elastic constants and ultimate strength of U were measured to determine the conditions for rupture under differential theraml expansions. It was found that a cylinder would split when the temperature difference between its center and the outside was between 450° and 1400°C, depending on the sample of metal used. In conclusion, several other properties such as hardness, density, and machining properties are discussed. (auth)

3681   CC-1383
[Chicago. Univ. Metallurgical Lab.]
CHEMICAL RESEARCH. THE HEAVY-WATER HOMOGENEOUS PILE: A REVIEW OF CHEMICAL RESEARCHES AND PROBLEMS. C. F. Hiskey. Feb. 28, 1944. Decl. Dec. 13, 1955. 85p. (A-2024) $13.80(ph OTS); $4.80(mf OTS).

A generalized review of the chemical problems and researches related principally to the heavy water homogeneous pile is presented herewith. This report covers researches performed principally by the Columbia Group who initiated the study. This report contains a chronological outline of the development, a discussion of some special topics whose significance is paramount in any slurry pile discussion, and finally an outline of important research problems remaining, roughly graded in order of their importance. No attempt was made to be either complete or detailed in the discussion. The emphasis was principally on furnishing a broad guide to those who may at some future date take up this work. (auth)

3682   CE-805
Chicago. Univ. Metallurgical Lab.
GENERAL ENGINEERING DESIGN FEATURES OF THE PILE FOR A LIGHT WATER COOLED P-9 POWER PLANT. L. A. Ohlinger. July 16, 1943. Decl. Dec. 12, 1955. 33p. $9.30(ph OTS); $3.60(mf OTS).

This report presents and discusses some of the general engineering problems and details involved in the design of a light water cooled pile for a D_2O power plant producing 50,000 Kw or better from about 10 tons of D_2O moderator and 6 tons of metal. Drawings are included to show some designs and variations in both horizontal and vertical piles, with miscellaneous details developed. (auth)

3683   CE-1132
[Chicago. Univ.] Metallurgical Lab.
DESIGN OF SEMI-WORKS, LIGHT-WATER-COOLED HETEROGENEOUS P-9 PILE. Terminal Report. Dec. 14, 1943. Decl. Dec. 14, 1955. 45p. Contract [W-7401-eng-37]. (A-1620). $19.80(ph OTS); $6.30(mf OTS).

This is a report of the work performed in finding and solving several problems, mainly of an engineering nature, attending the design of a light-water-cooled, heterogeneous D_2O pile of semi-works size. Such problems as the feasibility of a thorium blanket, heat removal, cooling water and power requirements, shielding, physical layout of manifolding systems for the cooling water, rod centering and replacement, tube replacement, etc., were considered. The physics design requiring 10 metric tons of D_2O and 6 tons of metal was used as a basis for the work. Allowable aluminum sheath temperature of 70°C, probable limit of cooling water velocity of 35 ft/sec, and optimum annulus dimensions for heat transfer (within the restrictions imposed by physics design) limit the plant power output to 50,000 Kw with cooling water available at 10°C. For Site X, the 35°C cooling water limits the power to 30,000

Kw. A cooling water piping system providing for individually controlled feed and exit lines is now recommended, because it provides needed flexibility of control and large savings in water and power requirements. The structural difficulties of providing individual control for 460 rods have been shown to be surmountable; detailed drawings and photographs of models are presented in the Appendix. Detailed drawings of satisfactory designs for rod and tube replacements are also included. Charts of the power output as limited by the temperature of the cooling water, the maximum allowable rod sheath temperature and the water flow rate are presented. "Boiling disease" can be eliminated if a pressure of 67 lb/in^2 is used on the inlet cooling water. The aluminum temperatures in the region of a rib may be as much as 25°C higher than the average metal temperature. A recycling helium gas system requiring 2 liters of catalyst, 100 ft^2 condenser area and 4 h.p. will serve to recombine the gases formed from the D_2O. Individual feed of cooling water to each rod will result in 50% saving in total water required. In addition, recycle cooling water will save in raw water purification at the expense of an air cooling system or liquid-liquid heat exchanger system employing raw river water on one side. Requirements of cooling water after shutdown become relatively negligible after one day. The knowledge accumulated and designs presented in this report and CE-805 would permit fairly rapid detailing and construction of this type of pile. No particular difficulties have appeared for which solutions have not been found. (auth)

3684   CE-1149
Chicago. Univ. [Metallurgical Lab.]
ENGINEERING INVESTIGATION OF P-9 HOMOGENEOUS PILE. Terminal Report. J. H. Chapin and F. R. Ward. Jan. 13, 1944. Decl. Dec. 15, 1955. 29p. Contract [W-7401-eng-37]. (A-1635). $15.30(ph OTS); $5.40(mf OTS).

The engineering design of a homogeneous, D_2O-moderated, slurry reactor was investigated. It was found that, provided the proper pumps and heat exchangers can be provided, D_2O utilizations of the order of 75,000 Kw/ton of D_2O external to the reactor, may be obtained with equipment of sizes common in industry. It was also found that approximately 9,000 Kw/ton of D_2O external to the pile can be removed from a reactor, discharging at 120°C, by a thermal syphon utilizing the thermal expansion of D_2O. Recommendations for further studies are given. (B.J.H.)

3685   CE-1150
[Chicago. Univ. Metallurgical Lab.]
THERMAL SYPHON FOR HEX P-9 PILE. G. F. Quinn. Jan. 10, 1944. Decl. Dec. 13, 1953. 13p. (A-1636) $3.30 (ph OTS); $2.40(mf OTS).

The use of a D_2O-moderated reactor in which UF_6 fuel would be circulated through the pile and through external heat exchangers by means of a thermal syphon is suggested. The quantities of power which might be dissipated in such a system and the price of this power in terms of tons of UF_6 are investigated. The large quantities of UF_6 required indicate that the use of such a system is not attractive. (B.J.H.)

3686   CF-46-6-23
[Clinton Labs., Oak Ridge, Tenn.]
THE [HANFORD] TEST PILE. L. A. Ohlinger. [1946?] Decl. Dec. 21, 1955. 11p. (Z-12). $3.30(ph OTS); $2.40(mf OTS).

A very general description is given of the Hanford Test Reactor. (B.J.H.)

3687   CF-47-4-34
Oak Ridge National Lab., Tenn.
RESEARCH PILE EXPERIMENTAL FACILITIES. J. T. Weills. Apr. 28, 1947. Decl. Dec. 7, 1955. 15p. Contract [W-7405-eng-26]. $13.80(ph OTS); $4.80(mf OTS).

Complete descriptions and blueprints are given of the ORNL Low Intensity Training Reactor (LITR) experimental facilities, including tubes for hydraulically actuated samples, tubes for pneumatically actuated samples, horizontal beam holes, etc. (B.J.H.)

3688   CF-48-2-139
[Oak Ridge National Lab., Tenn.]
DESIGN OF SHIM-SAFETY RODS. D. Nicoll. Feb. 4, 1948. Decl. Dec. 15, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The shim-safety rods for the high flux pile have been designed to meet the specifications set by the Physics Division and the mechanical limitations imposed by the pile. The shim-safety rods have adequate strength and sufficient cooling capacity to enable them to perform their function. The drive mechanism is capable of lifting and lowering the rods at the rated speed of 0.2 cm per second without exceeding the permissible overtravel during reversal of direction. The magnetic coupling is designed to lift over a thousand lbs without exceeding a coil current of 200 ma; and to give a release time of less than 30 msec. The energy acquired during the dropping of the shim-safety rod will be dissipated by the shock absorber within six inches travel of the rod. (auth)

3689   CF-49-11-48
Oak Ridge National Lab., Tenn.
ALTERNATE DESIGN OF HOMOGENEOUS PILE REACTOR CHAMBER. C. L. Segaser. Nov. 3, 1949. Decl. Jan. 6, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A schematic sketch is presented for a design of a homogeneous pile reactor chamber. The sketch merely shows the core-tank as it would be assembled in the pressure vessel. An explanation of the system is included. (C.H.)

3690   CF-49-12-1
Oak Ridge National Lab., Tenn.
HEAT PRODUCTION IN THE BOTTOM THERMAL SHIELD OF THE MATERIALS TESTING REACTOR. R. B. Briggs. Dec. 1, 1949. Decl. Dec. 20, 1955. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Preliminary calculations are presented on the heat production and temperature distribution in the thermal shield which served as a basis for an initial design of the Materials Testing Reactor. (C.H.)

3691   CF-49-12-18
Oak Ridge National Lab., Tenn.
MTR SHIELD SURVEY. REPORT NO. 3. G. Thornton. Dec. 5, 1949. Decl. Dec. 15, 1955. 25p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Equations are derived for the activity of delayed neutrons, photoneutrons, γ rays, and β rays after MTR shutdown. Calculated activities are tabulated. Calculations of the γ radiation from the active section after shutdown, of the γ radiation through the top plug during operation, and of shield requirements for protection against decay gammas are also included. (B.J.H.)

3692   CF-49-12-30
Oak Ridge National Lab., Tenn.
MTR DESIGN REPORT ON THE EXPERIMENTAL SHIELDING FACILITY. W. E. Sholl. Dec. 8, 1949. Decl. Dec. 20, 1955. 20p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Specifications are presented for a proposed design for an experimental shielding facility for the Materials Testing Reactor. The proposed design includes a water shield tank, a deep well storage pit, a shielding facility hole and associated watertight bulkhead, a shielding slab dolly, a converter plate, and necessary service facilities. The facilities are described and detailed drawings are included. (C.H.)

3693   CF-49-12-48
Oak Ridge National Lab., Tenn.
DISCHARGE TIMES OF HOMOGENEOUS REACTOR PILOT MODEL REFLECTOR FLOWING THROUGH 2-INCH PIPE FROM PRESSURE TANK. C. L. Segaser. Dec. 9, 1949. Decl. Dec. 20, 1955. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

One safety device proposed for control of the homogeneous pilot reactor consists of discharging the reflector by gravity flow through a quick-acting automatically-actuated safety valve into a storage tank presumably located immediately below the reactor. A visualized arrangement for such a tank is presented schematically. Calculations are presented on the discharge times of the reflector flowing through 2-in. pipe from the pressure tank. (C.H.)

3694   CF-49-12-82
Oak Ridge National Lab., Tenn.
HOMOGENEOUS REACTOR PILOT PLANT DESIGN STUDY. C. L. Segaser. Dec. 19, 1949. Decl. Jan. 6, 1956. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A diagrammatic sketch is presented of an arrangement for a steam pressurizer, gas recombiner, and core-tank in the pressure shell of the Homogeneous Reactor Pilot Plant. Advantages of this arrangement are discussed briefly. (C.H.)

3695   CF-49-12-83
Oak Ridge National Lab., Tenn.
XENON POISONING AT VARYING POWER LEVELS. J. A. Lane. Dec. 14, 1949. Decl. Dec. 20, 1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations are presented for estimating the effect of xenon poisoning as a function of power level for the Materials Testing Reactor. (C.H.)

3696   CF-50-4-17
Oak Ridge National Lab., Tenn.
COOLING REQUIREMENTS AT REDUCED POWER LEVELS. J. A. Lane. Apr. 3, 1950. Decl. Dec. 21, 1955. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations are presented on the water flow required for active lattice cooling and Be cooling of the MTR at reduced power levels. (C.H.)

3697   CF-50-4-148
Oak Ridge National Lab., Tenn.
LITERATURE SURVEY RE: BUBBLE FORMATION. R. H. Wilson. Apr. 27, 1950. Decl. Nov. 29, 1955. 5p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Bubble formation in a mock-up of the Homogeneous

Reactor Experiment core is discussed. A literature survey of bubble formation is included. 17 references. (C.H.)

3698 CF-50-5-140
Oak Ridge National Lab., Tenn.
INTERIM REPORT OF NEUTRON AND GAMMA EXPERIMENTS ON THE MTR MOCK-UP. S. E. Beall, W. M. Breazeale, R. B. Briggs, A. D. Callihan, and W. H. Jordan. May 11, 1950. Decl. Jan. 5, 1956. 37p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

The loading and the startup of the MTR mock-up are described. Criticality was attained Feb. 4, 1950 with 2020.4g of U^{235} in 13 fuel elements. The fuel elements with 2 safety rods were arranged in a slab 3 assemblies wide and 5 assemblies long. Beryllium pieces surrounded the fuel pieces. The arrangement is illustrated graphically. Neutron and γ flux measurements are described. The details of the physical arrangement of the experimental facilities and instrumentation are appended. Data from the measurements are presented graphically and results are compared with calculated data. (C.H.)

3699 CF-50-9-139
Oak Ridge National Lab., Tenn.
HRE—SLOW FLUX IN THE SHIELD. H. L. F. Enlund. Sept. 25, 1950. Decl. Dec. 19, 1955. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Slow neutron fluxes were calculated in two types of barytes concrete shielding for the Homogeneous Reactor Experiment, and results are given in graphical form. (B.J.H.)

3700 CF-51-7-106
Oak Ridge National Lab., Tenn.
CRITICALITY OF HRE WITH LOW ENRICHMENT, HIGH CONCENTRATION UO_2SO_4—WATER SOLUTION. L. H. Thacker and H. T. Williams. July 23, 1951. Decl. Dec. 2, 1955. 2p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80 (mf OTS).

3701 CF-52-2-232
Oak Ridge National Lab., Tenn.
HYDRAULIC TESTS FOR THE MTR. R. B. Briggs. Feb. 28, 1952. Decl. Dec. 15, 1955. 23p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The cooling water pressure distribution in the active lattice and the reflector of the MTR were measured as a means of evaluating whether the coolant flows and pressure distribution prescribed by the design were attained. Results indicate that the pressure distribution and coolant flow are acceptable. Complete data are summarized. (B.J.H.)

3702 CF-52-9-75
Oak Ridge National Lab., Tenn.
EFFECT OF POISONS ON THE CRITICALITY OF THE ISHR AT 250°C and 100°C. Chandler Barkelew and Melvin Tobias. Sept. 16, 1952. Decl. Dec. 19, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

This effect was calculated from the standpoint of various assumed conditions of operation in terms of lowering of temperature which would be necessary to maintain criticality at the fuel enrichments corresponding to the stated temperatures at a concentration of 250g of U per liter of solution. Estimations for the poisons were made by incorporating the absorptions into previously made two-group calculations for a "clean" reactor. (L.M.T.)

3703 CF-53-9-134
Oak Ridge National Lab., Tenn.
HRP DYNAMIC CORROSION STUDIES. Summary of Runs D2-9 Through D2-11. J. C. Griess and R. E. Wacker. Sept. 24, 1953. Decl. Dec. 20, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A series of runs were made in a loop in order to determine the effectiveness of a certain decontamination procedure for radiozirconium and radioniobium in the loop. Uranyl sulfate containing Zr and Nb was used to contaminate the loop. (B.J.H.)

3704 CF-54-3-175
Oak Ridge National Lab., Tenn.
ESTIMATE OF SHIELDING REQUIREMENTS FOR THE HRT DUMP TANKS. C. L. Segaser. Mar. 16, 1954. Decl. Dec. 19, 1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An estimate has been made of the shielding requirements of a proposed dump tank arrangement for the HRT. The dose rate on the surface of the dump tank shield one day after a dump has been calculated as a function of shield thickness. It was found that $3\frac{1}{3}$ ft. barytes concrete of density 3.5 g/cm^3 will reduce radiation dosage to 1 r/hr 24 hr after a shutdown when the reactor has been in operation for a long period of time. (M.P.G.)

3705 CF-54-12-143
Oak Ridge National Lab., Tenn.
OPERATION OF HRT CHARCOAL BEDS AT 10 MW REACTOR POWER. I. Spiewak. Dec. 20, 1954. Decl. Dec. 20, 1955. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The use of the Homogeneous Reactor Experiment charcoal absorbers for gas disposal from the Homogeneous Reactor Test is described. Heating for the charcoal beds, based on 10 Mw reactor operation, and the maximum heating of the charcoal beds were calculated. Two possible dump situations were considered: the first in which the reactor is not operating at power and only oxygen is released, and the second where power operation has been in progress and considerable quantities of radiolytic gas are dumped. (C.H.)

3706 CF-55-1-120
Oak Ridge National Lab., Tenn.
TWO-REGION THORIUM BREEDER-POWER REACTOR-PROGRESS REPORT NO. 3. M. Tobias and H. C. Claiborne. Jan. 19, 1955. Decl. Dec. 20, 1955. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1 80(mf OTS).

Calculations show that errors in estimates of two-group constants are of secondary economic importance in TBR power considerations. (C.W.H.)

3707 CF-3341
Chicago. Univ. Metallurgical Lab.
WATER EFFECTS ON A BeO PILE. J. Ernest Wilkins, Jr. and F. L. Friedman. Nov. 14, 1945. Decl. Dec. 15, 1955. 10p. Contract W-7401-eng-37. $1.80(ph OTS); $1.80(mf OTS).

An investigation was made of the changes in reactivity of a BeO-moderated pile which would be caused by the condensation of various amounts of H_2O. Complete results are given in both tabular and graphical form. (B.J.H.)

3708 CP-499
[Chicago. Univ. Metallurgical Lab.]
RADIOACTIVITY OF THE COOLING WATER. E. P.

Wigner. Mar. 1, 1943. Decl. Jan. 4, 1956. 8p. Contract
[W-7401-eng-37]. $1.80(ph OTS); $1.80(mf OTS).

The most important source of radioactivity at the exit
manifold of the pile was found to be O^{19}, formed by neutron
absorption in O^{18}. It was estimated that it would be safe
to stay ~ 80 min daily close to the exit manifolds without
any shield. Estimates are given for the radioactivities
from other sources, both in the neighborhood and farther
away from the pile. (auth)

3709   CP-1350
Chicago. Univ. Metallurgical Lab.
PERIPHERAL PRODUCTION. J. Stephenson. Mar. 30,
1944. Decl. Dec. 14, 1955. 12p. Contract [W-7401-eng-
37]. (A-1899). $3.30(ph OTS); $2.40(mf OTS).

The production of radioactive materials by absorption of
neutrons escaping the reactor is discussed. Calculations of
the efficiency with which the escape neutrons are utilized
by the absorber and efficiency of the reflector are pre-
sented. (C.W.H.)

3710   CP-1456
Chicago. Univ. Metallurgical Lab.
CALCULATIONS FOR SOME PILE SHAPES OF WHICH
THE BOUNDARIES ARE PARTLY SPHERICAL. G. Young,
F. H. Murray, and H. Castle. CHARACTERISTIC
NUMBERS AND FUNCTIONS FOR REGIONS WHICH ARE
APPROXIMATELY CYLINDRICAL OR SPHERICAL.
F. H. Murray. Feb. 25, 1944. Decl. Dec. 13, 1955.
11p. (A-2043). $3.30(ph OTS); $2.40(mf OTS).

Some methods for calculating the k requirements of
various shaped piles are indicated, with particular ref-
erence to the shape of the tank in the homogeneous plant.
(auth)

3711   CP-1662
Chicago. Univ. Metallurgical Lab.
ON THE BOUNDARY CONDITION BETWEEN TWO
MULTIPLYING MEDIA. F. L. Friedman and E. P.
Wigner. April 19, 1944. Decl. 13, 1955. 13p.
$3.30(ph OTS); $2.40(mf OTS).

The transition region between two parts of a pile which
have different compositions is investigated. In the case
where the moderator is the same in both parts of the pile,
it is found that the diffusion constant times thermal
neutron density plus diffusion constant times fast neutron
density satisfies the usual pile equations everywhere,
right to the boundary. More complicated formulas apply
in a more general case. (auth)

3712   CP-2907
[Chicago. Univ. Metallurgical Lab.]
THEORY OF OSCILLATING ABSORBER IN A CHAIN RE-
ACTING PILE. A. Cahn, Jr., A. T. Monk, and A. M.
Weinberg. Apr. 6, 1945. Decl. Dec. 15, 1955. 23p.
Contract W-7401-eng-37. $4.80(ph OTS); $2.70(mf OTS).

The fluctuation in pile intensity caused by an oscillating
point absorber is calculated. It is found that the nature of
the response depends on the frequency of the impressed
oscillation. If the frequency is high compared to the decay
rate of the high harmonics, the response consists of a
wave which is propagated away from the oscillator. If
the frequency is low, the propagated wave character of the
response disappears and the intensity of the whole pile
tends to oscillate with the same phase. The amplitude of
the response decreases with increasing frequency. (auth)

3713   CT-883
Chicago. Univ. Metallurgical Lab.
TEMPERATURE DISTRIBUTION IN AN ALUMINUM
SHEATH. Karl Cohen and Irving Kaplan. Aug. 2, 1943.
Decl. Dec. 12, 1955. 20p. (A-1315). $4.80(ph OTS);
$2.70(mf OTS).

The design of a water-cooled pile requires a U rod
sheathed in aluminum and surrounded by an Al tube. Cool-
ing water is to flow in the annular space between the two Al
cylinders. In order to center the U rod, the design calls
for ribs on the outer Al tube. A theoretical treatment is
given for the problem of the temperature distribution on the
surface of an Al sheath in the neighborhood of a rib. A
general treatment is given as well as the solutions cor-
responding to two simple profiles of the heat transfer
coefficient. The results indicate an appreciable tempera-
ture rise in the neighborhood of the rib. For a 35,000 kw
pile, with a velocity of cooling water of 35 ft/sec., the
temperature rise at the hot spot for a rod at the center of
the pile may reach 30°C. For piles operating at higher
energy output, or with lower velocities of the cooling
water, the temperature rise will be considerably greater,
and will effectively prevent the use of ribs. (auth)

3714   CT-969
Chicago. Univ. Metallurgical Lab.
P-9 (HEAVY WATER) UTILIZATION IN SLURRY PILE
COOLING SYSTEM. F. R. Ward and J. T. Weills. Oct.
5, 1943. Decl. Dec. 13, 1955. 32p. $6.30(ph OTS);
$3.00(mf OTS).

Preliminary investigations were made on the problems
of heat transfer and D_2O utilization in the cooling system
of a 40-ton homogeneous reactor. The most satisfactory
designs, from these viewpoints, are discussed. (B.J.H.)

3715   CT-1897
Michigan. Univ., Ann Arbor.
SUPERSONIC TRANSMISSION MEASUREMENTS ON
VARIOUS SAMPLES. Preliminary Report. F. A.
Firestone and W. G. Langton. July 4, 1944. Decl.
Dec. 13, 1955. 16p. (A-2663). $3.30(ph OTS); $2.40
(mf OTS).

Supersonic transmission data were obtained for 22
sample slugs at 2.25 and 1.0 Mc. A one-inch square
crystal was used for all measurements. The results of
the tests are described in detail. (B.J.H.)

3716   HW-10940
Hanford Works, Richland, Wash.
BORON STAINLESS STEEL FOR DROP RODS. A. C.
Callen, Jr. and A. L. Heckman. Sept. 7, 1948. Decl.
Dec. 28, 1955. 13p. Contract W-31-109-eng-52.
$3.30(ph OTS); $2.40(mf OTS).

The corrosion resistance of the boron stainless steel
and 347 stainless steel was found to be highly superior
to the corrosion resistance of the boron steel being used.
Examination of the microstructure showed the boron
stainless steel to be similar to that of type 302 stainless
except for the presence of the boron compounds distributed
in the austenite matrix. The ultimate strength was raised
40 to 50% by the presence of boron, which also embrittled
the material to a high degree. Impact results equivalent to
those obtained for 18-8 stainless steel samples are pos-
sibly misleading. The machinability of the material is at a
par with that of normal types of 18-8 stainless steel.
Centrifugal casting produces an extremely sound metal

lacking in faults or porosity. The need of further investigation of the physical properties obtainable by annealing at higher temperatures is pointed out. (auth)

3717   IDO-16078

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

THERMAL NEUTRON FLUX DISTRIBUTION IN THE HORIZONTAL THROUGH FACILITY IN THE MATERIALS TESTING REACTOR. G. O. Bright. Mar. 27, 1953. Decl. Jan. 5, 1956. 26p. Contract AT(10-1)-205. $4.80(ph OTS); $2.70(mf OTS).

A thermal neutron flux survey has been made as part of a complete flux determination in the HT-1 facility. Indium foil measurements along the centerline of the facility have been made over a four foot length in the highest flux zone. A series of cobalt wire measurements has been made to show the variation in flux from top to bottom and from side to side in the facility. These measurements were made at two shim-safety rod positions in order to determine changes in the neutron flux between startup and shutdown conditions. (auth)

3718   KAPL-24

[Knolls Atomic Power Lab., Schenectady, N. Y.]

TWO-GROUP REPRESENTATION OF AN INTERMEDIATE PILE. L. Tonks and R. Ehrlich. Jan. 19, 1948. Decl. Dec. 5, 1955. 18p. Contract [W-31-109-Eng-52]. $3.30 (ph OTS); $2.40(mf OTS).

A two-group (2G) formulation of the intermediate pile problem has been worked out on a semi-theoretical basis. The coefficients in the equations are calculated as weighted mean cross-sections, the weighting being based on an exact multigroup (M-G) calculation. The transfer from upper to lower group is also based on this calculation. For rather substantial variations of pile structure and constitution from that of the M-G basis the 2G method yields changes in ν_c which are 44 to 83% of those found by other M-G calculations. Better agreement is expected for smaller variations. (auth)

3719   KAPL-304

Knolls Atomic Power Lab., Schenectady, N. Y.

PERTURBATION THEORY FOR BOLTZMANN EQUATION. H. Brooks. Feb. 27, 1950. Decl. Dec. 5, 1955. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A first order perturbation theory is developed for the rigorous Boltzmann formulation of the pile equation. The physical significance of the resulting formalism is discussed for some examples corresponding to actual experiments conducted in the Preliminary Pile Assembly. (auth)

3720   KAPL-527

Knolls Atomic Power Lab., Schenectady, N. Y.

PILE NEUTRON PHYSICS II; NUCLEAR ENGINEERING COURSE; 1948-1949. A. M. Anderson. Jan. 13, 1949. Decl. Dec. 6, 1955. 18p. $3.30(ph OTS); $2.40(mf OTS).

Course lecture notes are presented on the following subjects: method of calculation of the distance neutrons travel before absorption; consideration of a diffusion equation which accounts for the flux in any unit volume of an infinite medium wherein there is a distributed source of neutrons which is proportional to the flux at any point; neutron density for a bare spherical pile, a pile with an infinite reflector, a pile with a finite reflector breeding blanket, and near a boundary; consideration of neutron

density for cubical, spherical, and cylindrical geometry. (C.H.)

3721   KAPL-528

Knolls Atomic Power Lab., Schenectady, N. Y.

SLOWING DOWN THEORY; NUCLEAR ENGINEERING COURSE; 1948-1949. H. E. Stevens. Jan. 20, 1949. Decl. Dec. 6, 1955. 14p. $3.30(ph OTS); $2.40(mf OTS).

Lectures presented during a course in Nuclear Engineering cover the following subjects: application of a slowing down theory to the position and energy changes of neutrons as they lose energy by collision; slowing down density in an infinite medium without absorption, slowing down density with absorption, and slowing down equation in a homogeneous pile. (C.H.)

3722   KAPL-551

Knolls Atomic Power Lab., Schenectady, N. Y.

PILE CONTROL I; NUCLEAR ENGINEERING COURSE; 1948-1949. F. E. Crever. Jan. 27, 1949. Decl. Dec. 6, 1955. 8p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The theory of reactor control and reactivity is discussed. Equations for the determination of neutron buildup in reactors are included. (C.W.H.)

3723   KAPL-964

Knolls Atomic Power Lab., Schenectady, N. Y.

BLANKET FISSIONS IN PPA-11. J. A. Bistline, Jr. Jan. 1952. Decl. Dec. 5, 1955. 38p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The blanket fissions in Preliminary Pile Assembly 11 were investigated under the Intermediate Power Breeder Program at KAPL and found to be 12.5 and 8.9% of the total core fissions for U^{238} and U^{235}, respectively. The conversion ratio for this type of reactor was found to be 1.20. The results are compared with those from Preliminary Pile Assembly 5 and from a U^{235} reactor directly surrounded by a uranium blanket. The comparison shows that breeding is greatly favored where the fast fission spectrum falls directly on the natural uranium. (auth)

3724   LA-47

Los Alamos Scientific Lab., N. Mex.

CRITICAL SIZE AND MULTIPLICATION NUMBER FOR UNTAMPED RECTANGULAR BLOCK BY VARIATION METHOD. Paul Olum and R. R. Davis. Jan. 8, 1944. Decl. Dec. 16, 1955. 18p. Contract [W-7405-eng 36]. $3.30(ph OTS); $2.40(mf OTS).

Critical sizes and multiplication numbers for rectangular parallelopipeds of square cross section are calculated using the integral variation method and a one-velocity group theory. (B.J.H.)

3725   MonC-398

Oak Ridge National Lab., Tenn.

ACTIVATION MEASUREMENT OF THE C-NEUTRON FLUX IN THE CLINTON REACTOR. J. W. Jones, H. M. Clark, and R. T. Overman. Feb. 27, 1948. Decl. Dec. 8, 1955. 37p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

Measurements of the C-neutron flux in the ORNL Graphite Reactor were carried out by activation of a series of elements: gold, silver, copper, manganese, aluminum, sodium, and indium. The activities were measured principally by a γ ion chamber. Activation of the elements was carried out both with and without Cd foil

covering. The flux was calculated by use of known cross sections and by comparison with the Clinton Standard Pile. The average of eighteen independent determinations yields a flux of 0.57×10^{12} n/cm^2/sec ($\pm 10\%$) at the pneumatic tube for the pile loading at the times of the experiments and a power level of 3600 kilowatts. From the pneumatic tube to center ratio which was also determined, the neutron density was calculated for the center. The value calculated was n = 1.28 n/cm^3/watt. By use of these flux figures the cross section for 5.3-y Co^{60} has been determined. The variation of activation with power level and the time of leveling of activity immediately after a change in power level were also studied. (auth)

3726   MonP-428
[Clinton Labs., Oak Ridge, Tenn.]
DISTRIBUTION FUNCTIONS AND FISSION PRODUCT POISONING. G. Young and L. Noderer. Nov. 6, 1947. Decl. Dec. 8, 1955. 21p. Contract W-35-058-eng-71. $4.80(ph OTS); $2.70(mf OTS).

Estimates for poisoning are calculated from functions previously used in describing the statistical distribution in capture cross section of fission products and from a later study of the distribution of known thermal capture cross sections. (L.M.T.)

3727   MonP-434
[Clinton Labs., Oak Ridge, Tenn.]
CRITICAL CONDITIONS FOR A MULTIPLYING SLAB REACTOR WITH A NON-MULTIPLYING REFLECTOR OF FINITE THICKNESS. H. L. Garabedian. Nov. 19, 1947. Decl. Dec. 8, 1955. 30p. Contract W-35-058-eng-71. $4.80(ph OTS); $2.70(mf OTS).

The pile equation for a multiplying region surrounded by an infinite non-multiplying reflector having the same scattering properties as the active pile is formulated as an integral equation with a symmetric displacement kernel. A variational technique is applied for the determination of the critical multiplication constant. (C.H.)

3728   MonP-457
[Clinton Labs., Oak Ridge, Tenn.]
CRITICAL MASS NEEDED TO OVER-RIDE Xe. G. Young. Dec. 19, 1947. Decl. Dec. 5, 1955. 13p. Contract W-35-058-eng-71. $3.30(ph OTS); $2.40(mf OTS).

3729   ORNL-563
Oak Ridge National Lab., Tenn.
"GO-NO GO" PLATE SPACING GAGES FOR THE MATERIALS TESTING REACTOR FUEL ASSEMBLIES. F. Kerze and J. T. Howe. Jan. 3, 1950. Decl. Jan. 5, 1956. 8p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Two types of go-no go gages have been designed for the inspection of the deep, narrow interplate spacings of the Materials Testing Reactor fuel assemblies. One of these gages has been constructed and has proved satisfactory for the rapid inspection of these channels. (auth)

3730   ORNL-701
Oak Ridge National Lab., Tenn.
MOCK-UP DESIGN REPORT. W. R. Gall and D. J. Mallon. Oct. 27, 1949. Decl. Dec. 8, 1955. 137p. Contract [W-7405-eng-26]. $22.80(ph OTS); $7.20(mf OTS).

Design work done on the mock-up of the Materials Testing Reactor (MTR) is discussed in detail. Each detail is explained as to the basis for design and reasons for

particular solutions that were selected. The outline starts with the tanks and then takes each item from the top plug down through the grids and grid supports to the bottom of the tank. Calculations are not given in detail, but results are given and general methods used are explained. Alternate designs are briefly discussed in some cases so that it will be known what others were considered and what the reasons were for their elimination. The reflector and the control system have been covered only briefly without going into the same detail as for the mechanical design of the tank, grids, etc. Conceptual design of the reactor for the most part was complete before design of the mock-up started, so that this was primarily a detailing job. Where conception was required it related to mechanical details and not to the over-all picture of the arrangement of the reactor. (auth)

3731   TID-5048
Brookhaven National Lab., Upton, N. Y.
INITIAL EXPERIMENTS ON THE BROOKHAVEN REACTOR. [PART] I. J. Chernick. Mar. 7, 1949. Decl. Dec. 8, 1955. 3p. $1.80(ph OTS); $1.80(mf OTS).

Observations from an analysis of start-up data of the ORNL Graphite Reactor are presented for use in the design and interpretation of the initial experiments on the Brookhaven Reactor. (L.M.T.)

NUCLEAR TRANSFORMATION

3732   CF-45-2-1
Clinton Labs., Oak Ridge, Tenn.
RELATIVE AND ABSOLUTE YIELD FROM ANTIMONY AND LANTHANUM PHOTONEUTRON SOURCES. A. H. Snell. Feb. 6, 1945. Decl. Dec. 20, 1955. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Preliminary data are tabulated on photoneutron yields of Be when irradiated by γ rays from Sb^{124} and La^{140}. The results show that for equivalent total γ strength, the Sb produces 47 times as many photoneutrons as the La, while for equivalent millicurie strength, the Sb produces 200 times as many photoneutrons as the La. (B.J.H.)

PARTICLE ACCELERATORS

3733   AECD-3930
California Research and Development Co., Livermore, Calif.
STRUCTURAL TARGET DAMAGE ACCOMPANYING SUDDEN LOSS OF VACUUM. J. P. Frankel. Aug. 24, 1951. Decl. with deletions Dec. 20, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

3734   AECD-3941
California Research and Development Co., Livermore, Calif.
TRANSIENT THERMAL STRESSES IN UNRESTRAINED FLAT PLATES AND THIN WALLED CYLINDRICAL TUBES. N. C. Ostrander. Aug. 6, 1951. Decl. Dec. 20, 1955. 7p. (CRD-T2B-47). $1.80(ph OTS); $1.80(mf OTS).

The magnitude of transient thermal stresses are calculated for the flat plates and thin-walled cylindrical tubes to be used as Materials Testing Accelerator targets. (B.J.H.)

3735   M-3712
[California. Univ., Berkeley. Radiation Lab.]
184″ CYCLOTRON DEUTERIUM ELECTROLYZER
TESTS. Report No. 11. W. J. Stephan. Mar. 20, 1947.
Decl. Nov. 29, 1955. 9p. Contract [W-7405-eng-48].
$1.80(ph OTS); $1.80(mf OTS).

Several operational characteristics of the D_2 electro-
lyzer were investigated to determine the feasibility of
using the electrolyzer with the 184-in. cyclotron. These
characteristics included temperature variations, auto-
matic cut-off, and electrode geometry. (C.W.H.)

RADIATION ABSORPTION AND SCATTERING

3736   CP-1676
Indiana. Univ., Bloomington.
RESONANCE ABSORPTION OF URANIUM IN MIXTURES.
Allan C. G. Mitchell, Leon J. Brown, John R. Pruett, and
Evar D. Nering. Mar. 31, 1944. Decl. Dec. 12, 1955.
14p. (A-2412). $3.30(ph OTS); $2.40(mf OTS).

Experiments were made on the neutron resonance ab-
sorption of U when admixed with various substances. The
experiments were carried out in a graphite pile 60 in. by
56 in. situated near the probe of the Indiana University
cyclotron. The experimental arrangements and technique
are described. The container of U mixtures was located at
a place in the cyclotron pile at which the resonance activity
was comparable to that in the Argonne U—graphite pile.
Measurements were made on UO_2; several mixtures of
UO_2 and C in the form of graphite; mixtures of sugar, used
as a source of pure H, and UO_2; slurries of UO_2 and H_2O or
D_2O; and thin films containing U. Data are tabulated. (C.H.)

3737   Y-389
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
   Ridge, Tenn.
MATERIALS TO RESIST ION BEAM EROSION. W. L.
Ross. Apr. 15, 1949. Decl. Dec. 7, 1955. 22p. Contract
W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

A series of tests were made to find a material to resist
calutron ion beam erosion. Various materials were ex-
posed to ion beams and the amount of erosion compared to
a standard, C-18 graphite. Extruded graphites (AGHT and
ECA) were only slightly better than C-18. BN and CbC
were as good as C-18 graphite. None of the materials
were definitely superior to C-18. (auth)

Refer also to abstract 3676.

RADIATION EFFECTS

3738   AECD-3928
North American Aviation, Inc. Downey, Calif.
RADIATION EFFECTS QUARTERLY PROGRESS REPORT
[FOR] JANUARY — MARCH 1954. F. E. Faris, ed. Aug.
15, 1954. Decl. with deletions Dec. 9, 1955. 47p. Con-
tract AT-11-1-Gen-8. $7.80(ph OTS); $3.30(mf OTS).

A study is made of the thermal conductivity of graphite,
and the temperature dependence of $[T^3/K]$ is shown for
various graphites. The thermal conductivity and electrical
resistivity of several brom-graphite residue compounds
were measured between 10 and 300°K. Thermal conductiv-
ity curves are given for neutron-irradiated and untreated
samples. The field dependence of the Hall coefficient and
the magnetoresistivity were determined from 5 to 15

kilogauss for a series of irradiated graphite samples.
Cyclotron irradiations of graphite targets were made at
various temperatures in order to gain information on the
nature of the processes responsible for annealing of
radiation damage in the low-temperature region. Analyses
of the release of stored energy during quasi-isothermal
annealing of graphite are shown, and the data are sum-
marized. The cyclotron irradiation of Th, U, and Au is
briefly discussed. Tempering curves are given for both
cold worked and cyclotron irradiated Th. The results of
pulse annealing cyclotron-irradiated samples of Cu wire
are shown graphically. The formation of colloidal particles
during thermal annealing of crystals is also discussed.
(B.J.H.)

3739   MIT-1028
Massachusetts Inst. of Tech., Cambridge.
CONDUCTIVITY CHANGES IN DIELECTRICS DURING
2.5 MEV X-RADIATION. F. C. Armistead, J. C.
Pennock, and L. W. Mead. Aug. 8, 1949. Decl. Dec. 7,
1955. 30p. (deleted version: AECD-2641). $4.80
(ph OTS); $2.70(mf OTS).

An apparatus has been designed and constructed to
measure the effect of 2 to 3 Mev x rays on the volume
conductivity of dielectric materials during the actual ir-
radiation period and to determine the recovery character-
istics following the end of irradiation. A description of
the apparatus and results of conductivity measurements
made on three different dielectrics are given in this
report. A high intensity (2000 R per minute) x-ray beam
was obtained with the use of a Van de Graaff generator.
Current through the samples of dielectrics was measured
with an FP-54 electrometer tube used in a Penick type
bridge circuit. Two dielectrics showed an increase in
conductivity during irradiation, followed by recovery
after the x-ray beam was turned off. The dielectrics
differed in the time factors for increase and recovery.
For the third material, polystyrene, only an upper limit
could be set to the conductivity during irradiation; namely,
2×10^{-17} (ohm-cm)$^{-1}$. (auth)

RADIOACTIVITY

3740   MonC-132
[Clinton Labs., Oak Ridge, Tenn.]
THE PRODUCTION AND MASS ASSIGNMENT OF A 90
DAY ACTIVITY IN ELEMENT 43. Progress Report [for]
April 1 to June 15, 1946. E. E. Motta and G. E. Boyd.
July 15, 1946. Decl. Nov. 28, 1955. 20p. Contract W-
35-058-eng-71. $3.30(ph OTS); $2.40(mf OTS).

The growth of a daughter activity from three-day Ru^{97}
has been observed. It has been shown that this activity is
an isotope of element 43, thus permitting its assignment
to Tc^{97}. The activity has a half life of approximately 90
days and its radiations consist largely of very soft elec-
trons having a half thickness of 1.5 mg/cm^2 of aluminum.
(auth)

SHIELDING

3741   A-4047
Iowa State Coll., Ames.
RADIATION SHIELDS AND THEIR FABRICATION. W.

Calderwood and C. F. Grey. Dec. 1945. Decl. Dec. 14, 1955. 17p. $3.30(ph OTS); $2.40(mf OTS).

A satisfactory sillimanite insulation-radiation shield was developed for use in the casting of U that could be easily fabricated and easily assembled and disassembled. For other high temperature experiments, an alundum cement insulation-radiation shield was developed which was satisfactory for continuous use up to 1800°C. (auth)

3742   AECD-3984

Oak Ridge National Lab., Tenn.
MEASUREMENTS OF AN IRON AND BORATED WATER SHIELD IN THE LID TANK—EXPERIMENT 10. E. P. Blizard and C. E. Clifford. Dec. 14, 1950. Decl. with deletions Dec. 12, 1955. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Measurements were made in a shield mockup consisting of various numbers of Fe plates followed by a layer of varying thicknesses of B_4C and a region of borated H_2O. Thermal and fast neutron and γ measurements were taken in the water behind the iron. Results are given in both tabular and graphical form. (B.J.H.)

3743   BNL-2158

Brookhaven National Lab., Upton, N. Y.
EFFECT OF SPHERICAL VOIDS ON GAMMA RAY PENETRATION. William W. Pratt and Herbert J. Kouts. Feb. 8, 1952. Decl. Dec. 15, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

Preliminary results are presented on the effect of aluminum spheres submerged in water on γ-ray penetration through the water. The spheres varied in diameter from 4 to 18 in. and were submerged from 0 to 36 in. below the surface of the water. It was found that the increase in γ-ray leakage integrated over the surface of the water was not very sensitive to the depth of the sphere. (M.P.G.)

3744   CF-54-5-200

Oak Ridge National Lab., Tenn.
REQUIREMENTS FOR HRT TOP PLUG. P. N. Haudenreich. May 27, 1954. Decl. Dec. 21, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The shield directly over the HRT core should be no thicker than 5 ft. Various shielding materials and arrangements have been investigated, and the results are summarized. Shields composed of iron-aggregate concretes and 1 in. of Pb appear to be the most satisfactory. A shield of Fe and H_2O would also be satisfactory but might be much more expensive. (M.P.G.)

SPECTROSCOPY

3745   ANL-4400

Argonne National Lab., Lemont, Ill.
MASS SPECTROSCOPY AND CRYSTAL STRUCTURE DIVISION QUARTERLY [FOR] SEPTEMBER 1, 1949 THROUGH NOVEMBER 30, 1949. Jan. 19, 1950. Decl. Dec. 13, 1955. 16p. Contract W-31-109-eng-38. $3.30(ph OTS); $2.40(mf OTS).

A new stable isotope was found to be present in V at mass 50 with an abundance of one part in 400 of the main isotope at mass 51. A sample of fission I was found to have a ratio of I^{129} to I^{127} equal to 6.44; this permitted an accurate determination of the half life of I^{129}. Three irradiated Pu samples were analyzed to determine the

abundances of the three isotopes at 239, 240, and 241. It was found that an analysis could be obtained with as little as two μgms of Pu. It was found that residual gases are an imporant source of error in precise atomic mass comparisons owing to differential retardation of the ions during analysis. Two different types of stable quadruply charged Sm ions are produced by 600-volt electron bombardment. A change in the crystal structure of diamond caused by neutron irradiation is discussed. Crystal structure results are given for YF_3, α-YOF, β-YOF, BiF_3, Bi_2OF_4, α-HBO_2, β-HBO_2, and $La_2O(OH)_4$ and $Nd_2O(OH)_4$. (auth)

3746   CP-2261

Chicago. Univ. Metallurgical Lab.
A METHOD FOR NEUTRON ENERGY MEASUREMENT. V. Alexander Nedzel. Oct. 18, 1944. Decl. Dec. 15, 1955. 11p. Contract [W-7401-eng-37]. $3.30(ph OTS); $2.40 (mf OTS).

A special magnetic spectrometer for determining the momenta of recoil protons is designed. The spectrometer components are discussed, and the expected performance calculated. (D.E.B.)

3747   NYO-3535

New Hampshire. Univ., Durham.
PROGRESS REPORT. Helmut M. Haendler. July 15, 1954. Decl. Dec. 7, 1955. 13p. Contract AT(30-1)-1097. $4.80(ph OTS); $2.70(mf OTS).

The infrared and ultraviolet spectra of BrF_3 and BrF_5 were investigated. An ultraviolet absorption method for the determination of UF_6 in gas streams is discussed. (C.W.H.)

THEORETICAL PHYSICS

3748   CP-1818

Chicago. Univ. Metallurgical Lab.
THE EFFECT OF THE MAXWELL DISTRIBUTION OF VELOCITIES ON THE NEUTRON DENSITY AND DIFFUSION LENGTH IN A METAL SPHERE. Gilbert N. Plass. June 27, 1944. Decl. Dec. 19, 1955. 13p. Contract [W-7401-eng-37]. (A-2644). $3.30(ph OTS); $2.40(mf OTS).

The change in the simple $Sh\mathcal{K}r/\mathcal{K}r$ distribution of neutrons in a spherical lump of U caused by the distribution in velocities of thermal neutrons is calculated. If the calculated curve is fitted as well as possible by a simple $Sh\mathcal{K}r/\mathcal{K}r$ curve, it is shown that the value of $\mathcal{K}$ obtained in this way is a function of r_0, the radius of the sphere. For small radii the $\mathcal{K}$ obtained in this manner will be as much as 25% greater than the $\mathcal{K}$ corresponding to average velocity neutrons. The change in the thermal utilization caused by the distribution in velocities is discussed. The flux of neutrons into a sphere is calculated taking into account the velocity distribution, and this is compared with the usual theory. (auth)

3749   LA-609

Los Alamos Scientific Lab., N. Mex.
CRITICAL DIMENSIONS OF WATER-TAMPED SLABS AND SPHERES OF ACTIVE MATERIAL. E. Greuling, H. Argo, G. Chew, M. E. Frankel, E. J. Konopinski, C. Marvin, and E. Teller. Aug. 6, 1946. Decl. Dec. 16, 1955. 24p. Contract [W-7405-eng-36]. $4.80(ph OTS); $2.70(mf OTS).

The magnitude and distribution of the fission rate per unit area produced by three energy groups of moderated neutrons reflected from a water tamper into one side of

an infinite slab of active material is calculated approximately. This rate is directly proportional to the current density of fast neutrons from the active material incident on the water tamper. The critical slab thickness is obtained by solving an inhomogeneous transport integral equation for the fast-neutron current density into the tamper. Slight alterations in the theory were made so that one could approximately compute the critical radius of a water-tamped sphere of active material. The derived formulae were applied to calculate the critical dimensions of water-tamped slabs and spheres of solid UF_6 having various isotope enrichment fractions. (auth)

3750   RL-16.6.49
[California. Univ., Berkeley. Radiation Lab.]
THE MATHEMATICAL THEORY OF SCATTERING. D. Bohm, J. Weinberg, E. Barankin, and A. Horn. [1944?]. Decl. Dec. 7, 1955. 92p. Contract W-7405-eng-48. (Spec.-49). $13.80(ph OTS); $4.80(mf OTS).

Consideration is given to the mathematical theory of scattering as applied to electromagnetic separation processes for U. Included are discussions on single scattering, calculations of contamination, and contamination resulting from multiple scattering. (B.J.H.)

URANIUM AND URANIUM COMPOUNDS

3751   A-1072
Madison Square Area, Manhattan District, New York.
TECHNICAL INFORMATION REPORT FOR THE PERIOD JANUARY 1—JANUARY 31, 1945. Feb. 15, 1945. Decl. Dec. 8, 1955. 31p. $6.30(ph OTS); $3.00(mf OTS).

Graphite cakes were added as filling to the UF_4—Mg reduction bomb. Magnesium, high in N content, showed decreased recasting and remelting yields. Deoxidation and pressing the charge material did not change the casting yield. The processing of carnotites is described. (C.W.H.)

3752   AECD-3856
Du Pont de Nemours (E. I.) & Co., Wilmington, Del.
THE MAGNITUDE OF THE η EFFECT. E. P. Wigner. Apr. 25, 1951. 3p. Decl. Dec. 2, 1955. (DPW-2071). $1.80(ph OTS); $1.80(mf OTS).

3753   AECD-3874
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
CRITICAL DIMENSIONS OF UNTAMPED CONICAL VESSELS. Raymond Murray. Aug. 25, 1947. Decl. Dec. 6, 1955. 6p. [Contract W-7405-eng-26]. (A-4.390.31). $1.80(ph OTS); $1.80(mf OTS).

A mathematical analysis of Poisson's equation for a spherical sector, which approximates a right circular cone, is presented. The ratio of the critical dimensions of an equivalent sphere to the height of the sector for various sector angles is derived from a comparison of first eigenvalues. (auth)

3754   AECD-3909
[Tennessee Eastman Corp., Oak Ridge, Tenn.]
INTERACTION OF SOLUTIONS OF URANIUM SALTS. Raymond Murray and George W. Schmidt. Jan. 2, 1947. Decl. Dec. 13, 1955. 12p. (A-7.390.20). $3.30(ph OTS); $2.40(mf OTS).

Criticality studies on vessels containing U solutions in proximity with other containers are reported. Sample calculations are included. (C.W.H.)

3755   CC-2522
California. Univ., Berkeley. Radiation Lab.
MELTING POINT—COMPOSITION DIAGRAMS IN THE $U-UBr_3$ SYSTEM. Carl Thurmond. Dec. 20, 1944. Decl. Dec. 15, 1955. 5p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

A portion of the liquid-solid phase equilibrium region of the system $U-UBr_3$ has been investigated by the method of thermal analysis. Uranium tribromide was prepared by introducing bromine vapor into a bulb containing finely divided uranium formed from the hydride. Cooling curves were obtained with the tribromide and then with various compositions of tribromide and uranium. The information obtained showed that no solid subhalide exists but that the metal was soluble in the halide. (auth)

3756   CF-53-9-96
Oak Ridge National Lab., Tenn.
SHIELDING PROPERTIES OF URANIUM. C. L. Storrs and J. M. Miller. Sept. 30, 1953. Decl. Dec. 19, 1955. 23p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70 (mf OTS).

Neutron and γ attenuation in a 3 in. × 3 ft. × 3 ft. slab of natural U were measured in the Lid Tank. Measurements were made with and without a thermal neutron shield of boron carbide-loaded plexiglass. Results are presented in graphical form. (B.J.H.)

3757   CF-338
Columbia Univ., New York.
MEMORANDUM ON THE CRITICAL CONDITION FOR A FAST NEUTRON CHAIN REACTION INSIDE A SPHERICAL SHELL OF URANIUM METAL. Bernard T. Feld and Leo Szilard. Dec. 26, 1941. Decl. Dec. 13, 1955. 8p. (A-387). $1.80(ph OTS); $1.80(mf OTS).

The critical size for the maintenance of a fast neutron chain reactor in a sphere of U^{235} or other element having high cross section for slow neutron fission is calculated when the material is surrounded by shell of uranium metal. The first approximation to the appropriate diffusion equation is used, in which it is assumed that there are two categories of neutrons: "slow," or neutrons below the fission threshold of U^{238}, and "fast" neutrons. The processes of fission, inelastic scattering and elastic scattering are considered. It is shown that the addition of the uranium metal shell reduces the mass of reacting material by a factor of about 12. The amount of core material would be 1.5 times greater if there were no fast neutron fission in the U^{238} shell. (auth)

3758   CP-1589
Chicago. Univ. [Metallurgical Lab.]
RESONANCE ABSORPTION IN LUMPS AND MIXTURES. S. M. Dancoff and M. Ginsburg. Apr. 17, 1944. Decl. Dec. 14, 1955. 47p. Contract [W-7401-eng-37]. (A-2254). $7.80(ph OTS); $3.30(mf OTS).

The resonance absorption of a lump is described in terms of three components. Calculations of resonance absorption are carried out using the model for the resonance spectrum of uranium recently derived; calculations are also made with variations of this model which involve local fluctuations in level strengths. For metal and oxide lumps the agreement with observation is satisfactory. For dilute mixtures, whose resonance activation was measured by Mitchell, computed values fall 20% to 30% above measured ores. (auth)

3759   CP-1598
[Chicago. Univ. Metallurgical Lab.]
THE INFLUENCE OF OPERATION ON TUBALLOY.
Frederick Seitz. Apr. 21, 1944. Decl. Dec. 15, 1955.
33p. Contract W-7401-eng-37. (A-2260). $6.30(ph OTS);
$3.00(mf OTS).

The influence of pile operation on the mechanical proper-
ties of U is estimated, particularly the hardening which re-
sults from atomic displacement, and the changes in
mechanical properties due to the presence of fission
products. It is concluded that the metal would become
very hard and brittle as a result of displacement during
the first day of operation if the diffusion of the interstitial
atoms and vacancies produced did not reverse the dis-
placement. The volume of rare gases generated in 100
days of operation is sufficient to cause considerable
trouble. (B.J.H.)

3760   CP-1732
Chicago. Univ. Metallurgical Lab.
THE DIFFUSION LENGTH OF THERMAL NEUTRONS IN
URANIUM. D. J. Hughes and E. W. Bragdon. May 27,
1944. Decl. Dec. 16, 1955. 10p. Contract [W-7401-eng-
37]. (A-2445). $1.80(ph OTS); $1.80(mf OTS).

Measurements made in a uranium cylinder result in a
mean value of 1.55 cm for the diffusion length L for dis-
tances of 1 to 4 cm from the base of the cylinder. Calcula-
tions give a value which agrees with the experimental result
and show further that L increases from 1.40 to 1.63 cm as
the neutrons diffuse a distance of 5 cm into the uranium.
(auth)

3761   CT-816
Ames Lab., Ames, Iowa.
TECHNOLOGY RESEARCH—METALLURGY. PART II
OF REPORT FOR MONTH ENDING JULY 24, 1943. 22p.
$4.80(ph OTS); $2.70(mf OTS).

Additional properties of U−Al, U−C, and U−Bi alloys
were determined. Anhydrous ThF_4 was prepared. The
effects of liner constituents, ammonium oxalate insoluble
material, and bomb dimensions on U production were in-
vestigated. The U casting program was continued.
(C.W.H.)

3762   HW-12832
Hanford Works, Richland, Wash.
THE SURFACE PREPARATION OF URANIUM FOR X-RAY
DIFFRACTION STUDIES BY THE SPECTROMETER TECH-
NIQUE. J. H. Bach and J. B. Burnham, Jr. Mar. 24,
1949. Decl. Dec. 6, 1955. 6p. $1.80(ph OTS); $1.80(mf
OTS).

Uranium samples cut from alpha rolled rods were sub-
jected to three different treatments in order to determine
the best method of surface preparation for x-ray-diffrac-
tion investigations by the spectrometer method. Electro-
polishing of the samples indicated three different surface
conditions whose appearance or disappearance depended
on the electropolishing time. The last of these phases,
which begins to appear after 3 to 5 minutes electropolish-
ing and completely dominates the surface after about 20 to
30 minutes of electropolishing, was found to be the de-
sired surface, nominally free of strains imposed by the
cutting and grinding of the sample. This method has been
adopted and will be used in future work of this type.
Etching in warm 50% nitric acid produced identical re-
sults. This method is inferior to electropolishing because
the reaction proceeds at a much slower rate, and long
etching times result in excessively pitted surfaces. The
classical metallographic technique, which consists in
alternative polishing and etching the sample, produced a
second x-ray-diffraction pattern which is superimposed
upon the pattern predicted by the accepted uranium
structure. This second pattern can be indexed as a simple
cubic lattice with an "a_0" of 6.642 A, indicative of a new
phase or compound formation. However, both the signifi-
cance and the reason for the appearance of this pattern
have yet to be explained satisfactorily. (auth)

3763   K-299(Rev.)
Carbide and Carbon Chemicals Corp. K-25 Plant, Oak
    Ridge, Tenn.
IMPROVEMENTS IN THE PRECISION AND ACCURACY
OF THE FISSION COUNTING METHOD. C. A. Kienberger
and R. E. Greene. Apr. 15, 1949. Decl. Dec. 27, 1955.
20p. Contract [W-7405-eng-26]. (KLO-50(Rev.))
$3.30(ph OTS); $2.40(mf OTS).

The precision of the fission counting method for U^{235} in
the Works Laboratory was improved by locating and
eliminating two large sources of error. A systematic
study was made of each step in the analytical procedure.
Variations in the surface condition of the Ni disks upon
which the U is plated was the major cause of erratic
sample results. A secondary cause was the rubber gaskets
used in the electroplating operation, which deteriorate
and consequently cause low results by absorption of the U.
Electropolishing the surface of the Ni disks and the use of
rubber gaskets showing no sign of aging have significantly
increased the precision of the method. (auth)

3764   LA-1188
Los Alamos Scientific Lab., N. Mex.
SHORT PERIOD γ-RAYS FROM U^{235} FISSION PRODUCTS.
J. E. Brolley, Jr. and M. S. Livingston. Jan. 15, 1951.
Decl. Dec. 10, 1955. 22p. Contract W-7405-eng-36.
$4.80(ph OTS); $2.70(mf OTS).

A search for γ-ray activities with period 1 to 100 msec
from the thermal neutron fission of U^{235} gave negative
results. The shortest observed was 0.43 ± 0.03 sec. The
period of B^{12} was found to be 27 ± 3 msec. The cyclotron
beam was pulsed to supply 1 to 10 msec neutron bursts.
Coincidence scintillation detectors were employed. (auth)

3765   NYO-5195
Mallinckrodt Chemical Works, St. Louis.
A REPORT ON THE EXAMINATION OF URANIUM
DIOXIDE WITH THE ELECTRON MICROSCOPE. W. A.
Oppold. Aug. 27, 1946. Decl. Dec. 1, 1955. 4p. $1.80
(ph OTS); $1.80(mf OTS).

No specific differences were noted in the particle size
and shape of du Pont and Mallinckrodt samples of UO_2.
(K.S.)

Refer also to abstracts 3601, 3672, and 3749.